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Nuclear Science Abstracts

NEW NUCLEAR DATA

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ANNOUNCEMENT

This quarterly issue of [illegible] covers the period from July 1, 1954 to Sept. 30, 1954 and supplements the cumulation of New Nuclear Data published as [illegible], No. 12B, for the first six months of 1954. An annual cumulation of New Nuclear Data will be published as [illegible] Vol. [illegible], No. 24B, dated Dec. 31, 1954. The annual author, subject, and availability indexes will be published in [illegible], No. 24A, dated Dec. [illegible], 1954.

The printing of this publication has been approved by the Director of the Bureau of the Budget August 2, 1954

NEW NUCLEAR DATA

1. Radioactivity, Levels, Abundances, Moments
2. Neutron Cross Sections
3. Ground State Q's
4. Mass Differences and Ratios (No new data in current quarter)

INTRODUCTION

The nuclear data presented here have been compiled by the Nuclear Data Group which is sponsored by the National Research Council and supported by the Atomic Energy Commission and the National Bureau of Standards.

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This issue of Nuclear Science Abstracts contains the third quarterly list of new nuclear data. Issue 24B will contain the annual cumulation of all data in the 1954 lists.

As the current literature is surveyed, the new nuclear results are first printed on 3" × 5" cards which are collected into sets of 100 to 150 cards each month. Individuals, laboratories, or libraries may subscribe to the card sets directly by applying to the Publications Office, National Research Council, 2101 Constitution Avenue, N. W., Washington 25, D. C. The price, based on actual mechanical costs, is currently $20 per year domestic and $30 per year foreign (air mail postage included for foreign but not for domestic subscriptions).

CONVENTIONS

All energies are given in Mev and all cross sections in barns unless otherwise stated in the tabular material.

Numerals in italics following a measured value are the error (as reported by the authors) in the last figures of the values. In cases where confusion seems possible, the conventional ± is used.

Magnetic moments are reported as before without diamagnetic correction but are now based on $\mu(H) = 2.79267$ and the substandards listed by H. Walchli, ORNL-1469.

In writing reactions in Table 1, Radioactivity, Levels, Abundances, Moments, superscripts to denote the A value of the target nucleus have been used only when the target material is monoisotopic or has been isotopically enriched. "$B^{10}(d,p)$," for example, means that the d,p reaction was observed in a sample enriched in B^{10} while "B(d,p)" means it was observed in natural B. This policy was followed previously for "heavy" but not for "light" nuclei. It was not practical to adhere to it in Table 3, Ground State Q's. In this table, enrichment is denoted by underlining the A superscript.

Even when enriched material is not used, the nucleus under which the information is listed is often fairly certain because of some large natural abundance or cross section, or because of the particular activity produced or energy released. In such cases the nucleus in question is put down without a following "?". When there is no indication as to the isotope involved, information is listed under the element in question.

When a method of production of a radioactive nucleus has been given, the lowest bombarding energy used by the experimenter is indicated; e.g. Ag(20-Mev p). If this energy has actually been determined to be the threshold, it is underlined, e.g. Sn(14-Mev p).

The large black dots on the decay schemes are used to indicate experimentally established coincidences. α, β, or γ rays entering a level and dotted at their arrowheads have been shown to be in coincidence with gamma rays leaving the same level and dotted at their origins. In case of a simple cascade, the dots of the incoming and outgoing rays are superimposed.

Electron capture, ϵ, is shown on decay schemes by long and short dashes. Dashes of equal length are used for doubtful radiations or levels.

For the light nuclei, energy levels in the compound nucleus are tabulated rather than the resonant energy of the bombarding particle. The binding energy of the bombarding particle in the compound nucleus is taken from the table of F. Ajzenberg, T. Lauritsen, Rev. Mod. Phys. 24, 321(1952) for $Z \leq 10$, or from P. M. Endt, J. C. Kluyver, Rev. Mod. Phys. 26, 95(1954) for Z from 11 to 20.

ABBREVIATIONS

a	absorption
aβγ	absorption of β's in coincidence with γ's
ace⁻	absorption of conversion electrons
a coin	measurement by placing absorbers between counters in coincidence
α	total γ-ray conversion coefficient, N_e/N_γ
$\alpha_K, \alpha_L, \ldots$	γ-ray conversion coefficient for electrons ejected from the K, L, ... shell
$\alpha_0, \alpha_1, \ldots$	α to g.s., first excited state, ... of residual nucleus
b	coefficient in angular correlation function, $1 + b \cos^2 \theta$
B	band spectra method
Beγn	measurement by detection of photoneutrons from Be
B_n, B_p	binding energy of a neutron, proton to a nucleus
$\beta\gamma(\theta)$	angular correlation of β's and γ's in coincidence
Calc	calculated from experimental work reported elsewhere
cc	cloud chamber
CcW	Cockcroft Walton accelerator
ce⁻	conversion electrons
chem	chemical separation of product following reaction
Cpt	Compton electrons
d	(1) deuteron, (2) descendant of, (3) days, when used as superscript
d,p(θ)	angular distribution of protons with respect to deuteron beam
Dγn,Dγp	measurement by detection of photoneutrons or photoprotons from deuterium
$\bar{E}$	average energy
E_0	resonance energy
$E_\beta, E_\gamma, \ldots$	energy of β ray, energy of γ ray, ...
E_{dis}	disintegration energy
EA	electrostatic analyzer
E1,E2, ...	electric dipole, electric quadrupole, ...
e_A	Auger electron
el	elastic scattering
ϵ	electron capture
ϵ_K, ϵ_L	electron capture from K, L shell
f	fission, in abbreviations for methods of production or detection
F-K	Fermi-Kurie β energy distribution plot
γ(θ,T)	numbers of γ's as function of angle and temperature

$\gamma\gamma$,$\beta\gamma$, $\alpha\gamma$, nγ	$\gamma\gamma$,$\beta\gamma$, $\alpha\gamma$, or nγ coincidences. (0.123 γ) (0.246 γ, 0.325 γ) means 0.123 γ in coincidence with 0.246 γ and 0.325 γ
Γ	resonance half-width (the whole width at half-maximum)
G-M	Geiger-Müller counter
g.s.	ground state
I	(1) nuclear induction magnetic resonance method; (2) spin in units $h/2\pi$. + or − signs after spin values denote even or odd parity of state in question
ic	ionization chamber
IT	isomeric transition
J	quantum state of compound nucleus in a nuclear reaction. "I" is used to denote the spin of the target nucleus, final nucleus
K/L	α_K/α_L
l	angular momentum of particle absorbed into or removed from nucleus
M	molecular or atomic beam resonance method
M1,M2, ...	magnetic dipole, magnetic quadrupole ...
mb	millibarns
Mic	microwave method
mir	measurement by total reflection of neutron beam from mirror surface
ms	mass spectrometer
μ	(1) magnetic moment in units of nuclear magnetons, (2) micron, 10^{-4} cm
μs	microseconds
osc	pile oscillator method
p	(1) proton, (2) predecessor of
p res	proton resonance. Magnetic field standardized by means of proton resonance frequency
para	paramagnetic resonance method
parentheses	parentheses are put around values which are given for identification purposes
pc	proportional counter
pe^-	photoelectrons
ppl	photoplates or emulsions
primes	primes indicate inelastically scattered particles
q	electric quadrupole moment in units of barns
quad res	quadrupole resonance method
Q	reaction energy in Mev
s	(1) spectrometer method, (2) seconds, when used as superscript
s pr	pair spectrometer
S	atomic spectra measurement
scin	scintillation counter
2 cryst scin s	2-crystal scintillation spectrometer
sl	lens spectrometer
sl ce^-	conversion electrons measured in lens spectrometer
st	strong
sπ	180° spectrometer
s$\pi\sqrt{2}$	double focusing spectrometer
σ	cross section in barns
σ_θ	cross section at resonance energy, E_θ
σ_a	absorption cross section
σ_{el}	elastic scattering cross section
σ_{inel}	inelastic scattering cross section
σ_s	scattering cross section
t	(1) triton, H^3, (2) total cross section when used under σ in cross section list
T	(1) isotopic spin; (2) temperature
τ	half life in units indicated
τ_1,τ_2	half life of upper, lower state
$\tau_{\beta\beta},\tau_{\epsilon\epsilon}$	half life for double β, double ϵ decay
th	thermal
VdG	Van de Graaff accelerator
w,vw	weak, very weak
%	% of disintegrations
†	relative numbers. When used in connection with γ rays, relative numbers of photons, not photons plus conversion electrons, are meant
+,−	even, odd parity when used in connection with level properties

Standard journal abbreviations are used.

1. RADIOACTIVITY, LEVELS, ABUNDANCES, MOMENTS

$He^5_{2\ 3}$ $\sim 10^{-21}$ s

Level Li(d,He^3) E_d = 14.5 s
g.s.

S.N.Levine, R.S.Bender, J.N.McGruer, W.F.Vogelsang, Phys. Rev. 95, 640A (1954).

Levels Li(n,t) E_n = 14.1 ppl
g.s.
2.4

D.L.Allan, Nature 174, 267 (1954).

$He^6_{2\ 4}$ 0.83 s

Levels $Li^{(7)}$(d,He^3)$He^{(6)}$ E_d = 14.5 s
g.s. $l_p = 1$ d,$He^3(\theta)$
1.71

S.N.Levine, R.S.Bender, J.N.McGruer, W.F.Vogelsang, Phys. Rev. 95, 640A (1954).

Level Li(γ,p) E_γ = 17.6
1.6 ppl
Collinearity of p and He^6 tracks suggests this level decays by γ emission

E.W.Titterton, T.A.Brinkley, Proc. Phys. Soc. 67A, 469 (1954).

$Li^5_{3\ 2}$

H(α,α) E_α = 3.1 to 5.3 ppl
No levels from 0.6 to 1.06 Mev above He + H
No maxima found in energy distribution of p's scattered forward by Po α's slowed down in scattering foil

C.Ruhla, J. phys. radium 15, 491 (1954).

$Li^6_{3\ 3}$ stable

Levels $Li^{(7)}$(d,t)$Li^{(6)}$ E_d = 14.5 s
g.s. $l_n = 1$ d,t(θ)
2.187 $l_n = 1$

S.N.Levine, R.S.Bender, J.N.McGruer, W.F.Vogelsang, Phys. Rev. 95, 640A (1954).

Levels $Li^{(7)}$(p,d)$Li^{(6)}$ E_p = 18
g.s. $l_n = 1$ p,d(θ)
(2.19) $l_n = 1$

J.B.Reynolds, K.G.Standing, Phys. Rev. 95, 639A (1954).

$Li^7_{3\ 4}$ stable

Level Li(p,d) E_p = 18
g.s. $l_n = 1$ See Li^6

J.B.Reynolds, K.G.Standing, Phys. Rev. 95,639A (1954).

$Li^7_{3\ 4}$ stable

Level Li(d,He^3) E_d = 14.5 s
g.s. $l_p = 1$ See He^6

Li(d,t) E_d = 14.5 s
g.s. $l_n = 1$ See Li^6

S.N.Levine, R.S.Bender, J.N.McGruer, V.F.Vogelsang, Phys. Rev. 95, 640A (1954).

Levels Li(d,p) E_d = 3.0
g.s. $l_n = 1$ d,p(θ)
(0.478) $l_n = 1$

W.E.Nickell, Phys. Rev. 95, 426 (1954).

Levels Li(d,d') E_d = 14.5 s
g.s.
0.478
4.61

Li(d,p)
g.s.
0.478
6.56

S.N.Levine, R.S.Bender, J.N.McGruer, W.F.Vogelsang, Phys. Rev. 95, 640A (1954).

Levels Li(n,n't)He^5 E_n = 14.1 ppl
4.6
6 to 7
9.3 ?

D.L.Allan, Nature 174, 267 (1954).

Levels* Li^7(γ,n) βtron
9.6 14.0
10.8 17.5
12.4
*Sharp breaks in n yield curve

J.Goldemberg, L.Katz, Phys. Rev. 95, 471(1954).

$Li^8_{3\ 5}$ 0.9 s

Li(d,p) scin
(12.5 β)(1.5 α)(θ) ~ isotropic contrary to previous report

S.S.Hanna, E.C.Lavier, C.M.Class, Phys. Rev. 95, 110 (1954).

Levels Li(d,p) E_d = 14.5 s
g.s.
1.0
2.28

S.N.Levine, R.S.Bender, J.N.McGruer, W.F.Vogelsang, Phys. Rev. 95, 640A (1954).

Be^{7} 4 3 53.6^{d}

Level	$B^{10}(p, \alpha\gamma)$	E_p = 1.52	
γ	0.432		scin

No other γ with $E_\gamma \leq 0.80$

R.B.Day, T.Huus, Phys. Rev. 95, 1003 (1954).

Be^{8} 4 4 ~10^{-16}s

$B^{10}(n,t)$ E_n = 14.1 scin

Reaction to g.s. not observed(< 0.3 mb/sterad)

F.L.Ribe, J.D.Seagrave, Phys. Rev. 94, 934 (1954).

Level	$Be^{9}(p,d)Be^{8}$	E_p = 18	
g.s.	l_n = 1		p,d(θ)

J.B.Reynolds, K.G.Standing, Phys. Rev. 95, 639A (1954).

Levels	$Li^{7}(p,\gamma)$		E_p = 0.45
1.8†	(4.09)	I = 2	α range
1.7†	5.31	I = 2	$\alpha,\gamma(\theta)$
1.0†	7.51	I = 0 or 2	

†Transitions to levels per 100 γ's from 17.63 level

E.K.Inall, Phil. Mag. 45, 768 (1954); E.K.Inall, A.J.Boyle, Phil. Mag. 44, 1081 (1953).

Level	Li(d,n)	E_d = 0.75
5.4		a pc

4.9 level not found

G.C.Reid, Proc. Phys. Soc. 67A, 466 (1954).

Level	Li(p,γ)	E_p = 0.45
γ	(17.6) M1,E2	$e^+e^-(\theta)$

S.Devons, G.Goldring, Proc. Phys. Soc. 67A, 413 (1954).

Level	Li(p,n)	E_p = 1.9 to 2.4
~18.9 (resonance near threshold)		

H.W.Newson, J.H.Gibbons, Phys. Rev. 95, 640A (1954).

$Li^{6}(d,\alpha)$ E_d = 0.06 to 0.45

$Li^{6}(d,n)53.6^{d}Be$

No resonances n/α yield ~ constant

F.Hirst, I.Johnstone, M.J.Poole, Phil. Mag. 45, 762 (1954).

Be^{9} 4 5 stable

Level	$Be^{9}(p,d)Be^{8}$	E_p = 18	
g.s.	l_n = 1		See Be^{8}

J.B.Reynolds, K.G.Standing, Phys. Rev. 95, 639A (1954).

Be^{9} 4 5 stable

Levels	$B^{10}(n,d)Be^{9}$	E_n = 14.1	scin
8† g.s.	l_p = 1		n,d(θ)
5† (2.43)	l_p = 1		

No 1.5 level (< 0.4†)

No other level below 5.5

†Peak cross section in mb/sterad

F.L.Ribe, J.D.Seagrave, Phys. Rev. 94, 934 (1954); 95, 649A (1954).

Level	$B^{11}(d,\alpha)$	E_d = 0.427
2.431 δ		s

R.B.Elliott, D.J.Livesey, Proc. Roy. Soc. 224A 129 (1954).

Levels	$Be^{9}(e,e')$	E_e = 190
2.54*		s
6.96*		

*From preliminary calibration

J.A.McIntyre, B.Hahn, R.Hofstadter, Phys. Rev. 94, 1084 (1954).

Levels	Li(d,p)0.9*Li^{8}	
17.30	E_d = 0.7 to 3.3	
17.49		

No 17.8 level

S.Bashkin, Phys. Rev. 95, 1012, 640A (1954).

B^{9} 5 4

Levels	$B^{(10)}(p,d)B^{(9)}$	E_p = 18	
g.s.	l_n = 1		p,d(θ)
2.4	l_n = 1		

J.B.Reynolds, K.G.Standing, Phys. Rev. 95, 639A (1954).

B^{10} 5 5 stable

Level	$B^{(11)}(p,d)B^{(10)}$	E_p = 18	
g.s.	l_n = 1		p,d(θ)
$B^{(10)}(p,d)B^{(9)}$			
g.s.	l_n = 1		See B^{9}

J.B.Reynolds, K.G.Standing, Phys. Rev. 95, 639A (1954).

Level	$B^{10}(p,p'\gamma)$	E_p = 1.5 to 2.6
γ	0.718	scin

No other γ observed

R.B.Day, T.Huus, Phys. Rev. 95, 1003 (1954).

Levels	$Be^{9}(d,n)$	E_d = 0.75	
0.6	2.9 ?		a pc
1.8	3.5		
2.2			

G.C.Reid, Proc. Phys. Soc. 67A, 466 (1954).

B^{10} 5 5 stable

	$Be^9(d,n)$	$E_d = 0.66$
(0.72 γ) (2.86 γ, 1.43 γ, 0.41 γ)		
(1.02 γ) (1.43 γ, 0.72 γ, 0.41 γ)		
(1.43 γ) (2.15 γ, 1.43 γ, 0.41 γ)		

γγ(θ) consistent with known spin assignments

S.M.Shafroth, S.S.Hanna, Phys. Rev. 95, 86, 641A (1954).

Levels	$Li(\alpha,\gamma)$	E_α = 0.4 to 1.4	
	4.75		
<2†*	(5.11)	J = 2⁻	T = 0
100†	5.162 δ	J = 2⁺	T = 1

*No resonance observed
Excitation function used for spin assignments
Estimates of T admixtures given

G.A.Jones, D.H.Wilkinson, Phil. Mag. 45, 703 (1954).

Capture γ's	$Be^9(p,\gamma)$		scin
6.87 level	E_p = 0.315	J = 1	
0.72	100†	5.1	
1.03	40†	6.0	
1.43	15†	6.7	
45†	4.7		

(1.03 γ) (0.72 γ)(θ) I = 0, 1, 3*

R.R.Carlson, E.B.Nelson, Phys. Rev. 95, 641A (1954); *verbal report.

	$Be^9(p,\gamma)$	E_p = 1.0
γ	(7.48)	E1 + (E3 or M2) $e^+e^-(\theta)$

S.Devons, G.Goldring, Proc. Phys. Soc. 67A, 413 (1954).

Level	$Be^9(p,\alpha\gamma)$	E_p = 1.2 to 2.7	
(8.89)	T = 1*	Γ = 0.041	s

*Resonant for α's to 3.57 Li^6 level but not for α's to g.s. or 2.19 level

R.Malm, D.R.Inglis, Phys. Rev. 95, 993,641A (1954).

B^{11} 5 6 stable

Levels	$Li(\alpha,>4.5\gamma)$	E_α = 0.5 to 2.5
9.19	Γ = 4 kev	
9.29	Γ = 7 kev	

No capture resonances from E_α = 0.96 to 2.5

Levels	$Li(\alpha,\alpha'\ 0.478\ \gamma)$	E_α = 1.5 to 3.5	scin
9.88			
10.24		10.39 ?	
10.32 ?		10.62	

N.P.Heydenburg, G.M.Temmer, Phys. Rev. 94, 1252, 748A (1954).

B^{12} 5 7 0.03s

Levels	B(d,p)	E_d = 4.15	s
0.940			
1.664			

L.M.Khromchenko, Doklady Akad. Nauk SSSR 94, 1037 (1954).

C^{10} 6 4 19s

Levels	$B^{10}(p,n)$	E_p = 17	ppl
3.34*			
~5.1*			
~5.5*			

F.Ajzenberg, W.Franzen, J.G.Likely, Phys. Rev. 95, 641A(1954); *verbal report.

C^{11} 6 5 20.4m

β^+	0.968 δ	B(1.77-Mev d); sl

C.Wong, Phys. Rev. 95, 765 (1954).

Levels	$B^{10}(p,\sim 9.7\ \gamma)$	E_p = 0.5 to 2.5
9.8		
10.9 ?		

No resonances at E_p = 0.78, 0.95, 1.33

Level	$B^{10}(p,\alpha\ 0.432\ \gamma)$	
10.08		scin

R.B.Day, T.Huus, Phys. Rev. 95, 1003 (1954).

C^{12} 6 6 stable

Levels	$C(\alpha,\alpha'\gamma)$	E_α = 22
(4.43)		α', C recoil
7.7		α', no C recoil*
12.7		α'

*Probability of decay to $Be^8 + \alpha$ > 80%
Broad α group at small angles may be from overlapping C^{12} states from 9 to 11.7 Mev

D.W.Miller, V.K.Rasmussen, W.B.Sampson, Phys. Rev. 95, 649A (1954).

γ	$C(p,p'\gamma)$	E_p = 30 to 340	
15.2			s pr

γ also produced by $B^{11}(d)$ but not $B^{10}(d)$

D.Cohen, B.J.Moyer, H.Shaw, C.Waddell, Phys. Rev. 95, 664A (1954).

Levels*	$C(\gamma,n)$ $20.4^m C^{11}$			β tron
19.3	20.5	21.6		
19.8	20.7	22.4		
20.1	21.1	22.8		

*Sharp breaks in activation curve

L.Katz, R.N.H.Haslam, R.J.Horsley, A.G.W.Cameron, R.Montalbetti, Phys. Rev. 95, 464 (1954).

Levels*	$C(\gamma,n)$			β tron
20.1	20.8	21.6		
20.5	21.2	22.4		

*Sharp breaks in n yield curve

J.Goldemberg, L.Katz, Phys. Rev. 95, 471 (1954).

C^{13} 6 7 stable

Levels	C(d,p)			d,p(θ)
	σ*		σ*	l_n
0.12	3.71	1	0.14 6.91	0 or 1
0.20	3.88	2	0.08 7.23	0 or 1
0.08	4.75	0	0.08 7.39	0 or 1
0.08	5.03	0	0.13 7.58	0
0.06	5.22	0	0.12 7.75	0 or 1
0.05	5.45	0	0.13 7.88	2
0.05	5.78		0.13 8.02	1
0.12	6.21	0	0.20 8.16	0 or 1
0.11	6.36	0	0.25 8.34	
0.13	6.63	0	0.24 8.53	

*Total cross section in barns

J.Catalá, F.Senent, Anales real soc. espan fis. y quim. 50A, 55 (1954).

C^{14} 6 8 ~5600y

τ 5900y 250 extrapolation ic

R.S.Caswell, J.M.Brabant, A.Schwebel, J. Research Nat. Bur. Standards 53, 27 (1954).

		C^{13}(d)		E_d = 4.0	
γ	s	6.14	w	7.11*	s pr
	w	6.48*	w	7.37*	
	s	6.72*			

*Might be in N^{14}

R.D.Bent, T.W.Bonner, R.F.Sippel, Phys. Rev. 95, 649A (1954).

N^{14} 7 7 stable

		C^{13}(d)		E_d = 4.0	
γ	s	4.96	w	6.48*	s pr
	s	5.12	s	6.72*	
	s	5.74	w	7.11*	
			w	7.37*	

*Might be in C^{14}

R.D.Bent, T.W.Bonner, R.F.Sippel, Phys. Rev. 95, 649A (1954).

N^{15} 7 8 stable

Levels	C^{14}(p,γ)		E_p = 0.3 to 1.7
	10.54*		scin
	10.70*	J = 3/2-	p,γ(θ)
	10.80*	J = 3/2-?	p,γ(θ)
	(11.30)**	J = 1/2- p,n(θ)	p,γ(θ)

*g.s. γ and ~5.3 γ observed **g.s. γ and n

G.A.Bartholomew, F.Brown, H.E.Gove, A.E.Litherland, E.B.Paul, Phys. Rev. 95, 595, 649A (1954).

O^{14} 8 6 72s

τ 72.1s

β^+ 1.835 δ F-K plot linear sl ft = 3275 ± 75

No 4.1 β^+ (< 0.3% of 1.84 β^+, log ft > 7.3)

J.B.Gerhart, Phys. Rev. 95, 288(1954).

O^{16} 8 8 stable

γ F^{19}(p,αγ) (6.14) E3 $e^+e^-(\theta)$

S.Devons, G.Goldring, Proc. Phys. Soc. 67A, 413 (1954).

O^{16} 8 8 stable

Levels	N^{15}(p,γ)		E_p = 0.3 to 2.0
< 1†	(12.43)		
100†	(13.09)	J = 1	p,γ(θ)
	N^{15}(p,α 4.4γ)		p,γ(θ)
	13.65	J = 1+ or 2- Γ ~ 0.15	

†Relative γ yield

A.A.Kraus, Jr., Phys. Rev. 94, 975 (1954).

Levels*	O(γ,n)2.0mO^{15}		β tron
	15.60	17.54	
	15.97	17.66	
	16.45	17.72	
	16.68	17.88	
	16.86	18.48	
	16.94	18.73	
	17.04	18.91	
	17.43		

*Sharp breaks in activation curve

B.M.Spicer, A.S.Penfold, J.Goldemberg, Phys. Rev. 95, 629A (1954).

Levels*	O(γ,n)2.0mO^{15}			β tron
	15.9	16.9	19.3	
	16.4	17.1	20.7	
	16.7	18.9	21.9	

*Sharp breaks in activation curve

L.Katz, R.N.H.Haslam, R.J.Horsley, A.G.W.Cameron, R.Montalbetti, Phys. Rev. 95, 464 (1954).

Levels*	O(γ,n)			β tron
	19.1	20.7	21.9	

*Sharp breaks in n yield curve

J.Goldemberg, L.Katz, Phys. Rev. 95,471(1954).

Levels N(d,α) E_d = 0.60,0.73 d,α(θ)
~21 I = 1-, 2+, 3- states found

D.Cartwright, L.L.Green, J.C.Willmott, Phil. Mag. 45, 742 (1954).

O^{17} 8 9 stable

q -0.004 Mic

Calculated from data of Geschwind et al, Phys. Rev. 85, 474 (1952).

G.R.Bird, C.H.Townes, Phys. Rev. 94, 1203 (1954).

F^{17} 9 8 66s

τ 66s O(2.1-Mev d)

β^+ 1.748 δ sl

No 0.87 β^+ (< 1% of 1.748 β^+)

C.Wong, Phys. Rev. 95,765(1954); 92,529A (1953).

F^{18} 9 9 1.87h

Level F^{19}(p,d)F^{18} E_p = 18
g.s. l_n = 0 p,d(θ)

J.B.Reynolds, K.G.Standing, Phys. Rev. 95, 639A (1954).

F^{19} 9 10 stable

Level $F^{19}(p,d)F^{18}$ $E_p = 18$
g.s. $l_n = 0$ See F^{18}

J.B.Reynolds, K.G.Standing, Phys. Rev. 95, 639A (1954).

Levels $F^{19}(p,p'\gamma)$ $E_p = 0.3$ to 1.5 s
0.1139 I = 1/2 $p,p'(\theta)$ $p,\gamma(\theta)$
0.1996 I = 5/2+ $p,p'(\theta)$ $p,\gamma(\theta)$
No 0.0857 γ (< 1% of 0.200 γ) scin
See also Ne^{20}

R.W.Peterson, C.A.Barnes, W.A.Fowler, C.C.Lauritsen, Phys. Rev. 94, 1075 (1954); 94, 951A (1954).

Levels $F^{19}(p,p'\gamma)$ E_p = 1.4, 1.1
(0.114) $\tau = 0.1\times10^{-8}$s recoil
(0.200) $\tau = 8\times10^{-8}$s

J.Thirion, C.A.Barnes, C.C.Lauritsen, Phys. Rev. 94, 1076 (1954).

Levels $F^{19}(\alpha,\alpha'\gamma)$ $E_\alpha = 0.6$ to 2.8
(0.114) I = 1/2-*
(0.200) I = 5/2+*
*From agreement of observed τ_γ's and τ_γ's calculated from σ's and these spins

R.Sherr, C.W.Li, R.F.Christy, Phys. Rev. 94, 1076 (1954).

Levels $F^{19}(\alpha,\alpha'\gamma)$ $E_\alpha = 1.1$ to 2.4
γ 0.113 scin
0.196
Yield (0.196 γ)>> yield (0.113 γ)
No 0.083 γ (< 2% of 0.196 γ)

N.P.Heydenburg, G.M.Temmer, Phys. Rev. 93, 351 (1954); 94, 748A, 1252 (1954).

Levels* $F^{19}(\gamma,n)1.87^hF$ β tron
10.6 11.9
10.9 12.2
11.2 15.3
11.5
*Sharp breaks in activation curve

J.G.V.Taylor, L.B.Robinson, R.N.H.Haslam, Can. J. Phys. 32, 238 (1954).

Levels* $F^{19}(\gamma,n)$ β tron
11.0 11.9
11.5 15.3
*Sharp breaks in n yield curve

J.Goldemberg, L.Katz, Phys. Rev. 95, 471(1954).

F^{20} 9 11 12^s β^- 100% 5.419 *13* F^{19}(2.3-Mev d) sl
F-K plot linear to 1 Mev
γ 1.627 sl pe^-
No 7.05 β (< 0.03%)

C.Wong, Phys. Rev. 95, 761(1954); 92, 529A (1953).

Ne^{19} 10 9 18.5^s β^+ branching to 0.1-0.2 F^{19} levels < ~0.1%

W.P.Alford, D.R.Hamilton, Phys. Rev. 94, 779A (1954); verbal report.

Ne^{20} 10 10 stable

Levels $F^{19}(p,p'\ 0.114\ \gamma)$ $p,p(\theta)$

J		J
(13.505) 1+	(14.157)	2-
(13.759) 1+	(14.182)	2-
(13.907) 2-	14.230	1+

$F^{19}(p,p'\ 0.200\ \gamma)$

(13.700) 2-	(14.157)	2-
(13.907) 2-	(14.182)	2-

R.W.Peterson, C.A.Barnes, W.A.Fowler, C.C.Lauritsen, Phys. Rev. 94, 1075 (1954); 94, 951A (1954).

Ne^{21} 10 11 stable

Level $Ne^{20}(d,p)$ $E_d = 0.877$
0.349 s

K.Ahnlund, Arkiv Fysik 7, 155 (1954).

Ne^{22} 10 12 stable

Level $F^{19}(\alpha,p\gamma)$ $E_\alpha = 1.3$ to 3.5
γ 1.28* scin
No 0.4 γ
*Not F^{19} 1.37 γ. Assignment from agreement with known level.

N.P.Heydenburg, G.M.Temmer, Phys. Rev. 94, 1252 (1954).

Na^{22} 11 11 2.6^y ϵ 9±5% $\gamma\gamma/\gamma$ GM

R.Sehr, Z. Phys. 137, 523 (1954).

Level $F^{19}(\alpha,n\gamma)$ $E_\alpha = 3.1$ to 3.5
γ 0.592 $\tau < 0.01^s$ scin
Assignment from rise in n yield ~0.7 Mev above threshold

N.P.Heydenburg, G.M.Temmer, Phys. Rev. 94, 1252 (1954).

Na^{23} 11 12 stable q +0.10 S

P.L.Sagalyn, Phys. Rev. 94, 885 (1954).

$Na^{23}(\alpha,\alpha'\gamma)$ $E_\alpha = 1.4$ to 3.5*
γ 0.446 scin

N.P.Heydenburg, G.M.Temmer, Phys. Rev. 95, 629A (1954); *verbal report.

Na^{23} 11 12 stable

Levels $F^{19}(\alpha,\alpha'\ 0.114\ \gamma)$ scin

E_α = 1.0 to 3.5

12.32	12.68	13.03
12.55	12.78	13.13
12.60	12.90	13.26

$F^{19}(\alpha,\alpha'\ 0.200\ \gamma)$

12.32	12.60	13.00
12.40	12.68	13.13
12.47	12.78	13.26
12.55	12.90	

Levels $F^{19}(\alpha,p\ 1.28\ \gamma)$ scin

11.73	12.40	E_α = 1.3 to 3.5
11.91	12.47	12.85
12.08	12.55	12.90
12.15	12.60	13.00
12.24	12.68	13.13
12.32	12.78	13.26

$F^{19}(\alpha,n\ 0.59\ \gamma)$ scin

13.13	E_α = 3.1 to 3.5
13.26	

N.P.Heydenburg, G.M.Temmer, Phys. Rev. 94, 748A, 1252 (1954).

Mg^{23} 12 11 11^s

τ	10.7^S	Mg($\leq$ 70-Mev γ)
β^+	2.95	scin

W.A.Hunt, R.W.Kiline, D.J.Zaffarano, Phys. Rev. 95, 611A (1954).

Mg^{24} 12 12 stable

Capture γ's $Na^{23}(p,\gamma)$ E_p = 0.305

γ	1.38	scin
	4.2	3 cryst scin
	6.7	
	7.9	
	10.7 b = −0.24 $p,\gamma(\theta)$	

No 11.9 γ (<2% of 10.7 γ)

(1.38 γ)(10.7 γ) (7.9 γ)(4.2 γ)

(1.38 γ, > 1.4 γ)(> 1.4 γ)(> 1.4 γ)

Energy region between 1.5 and 3.0 not studied

No α's from 11.95 level (<20%)

R.R.Carlson, E.M.Geer, E.B.Nelson, Phys. Rev. 94, 1311(1954); 95, 650A (1954).

Levels	$Na^{23}(p,\gamma)$	E_p = 1.0 to 2.5
	$Na^{23}(p,\alpha)$	scin, pc
52 levels	12.7-14.0	Γ's given

P.M.Stelson, W.W.Preston, Phys. Rev. 95, 974 (1954).

Mg^{28} 12 16 21.4^h

		p	2.3^mAl	Mg(39-Mev α) chem
τ		21.3^h		Si(≤100-Mev γ) chem
β^-		0.40		a
γ	96†	0.0319	α_K = 0.032	M1 scin
			$\tau < 2\times10^{-9}$s	
	31†	0.40		
	29†	0.95		
	70†	1.35		

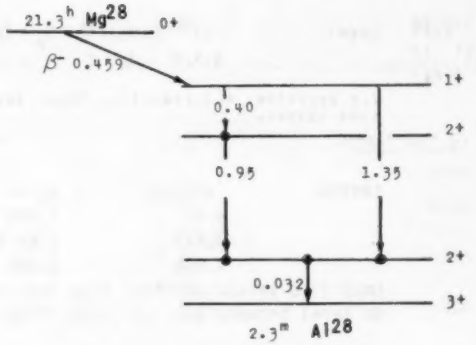
(0.0319 γ)(0.40 γ, 0.95 γ, 1.35 γ)

(0.40 γ)(0.95 γ)

No γ with E_γ > 2.0 (< 1†)

1.015 Al^{28} level not populated by 21.4^hMg

Mg^{28} 12 16 21.4^h



R.K.Sheline, N.R.Johnson, P.R.Bell, R.C.Davis, F.K.McGowan, Phys. Rev. 94, 1642(1954); 90, 325(1953); 89, 520 (1953).

Al^{24} 13 11 2.1^s

τ	2.0^S	Mg(< 20-Mev p)	
β^+			scin
γ	1.38	5.4	scin
	2.70	5.7 ?	
	4.2	7.0	
$\alpha/(>1\text{-Mev }\gamma)$	~0.003		scin

S.W.Breckon, A.Henriksen, W.W.Martin, J.S.Foster, Can. J. Phys. 32, 223 (1954).

Al^{25} 13 12 7.6^s

τ 7.62^S *13*

$Mg^{24}(p,\gamma)$ EA

Level	E_o	Γ
2.51	0.2255 *3*	0.006
2.69	0.4184 *4*	0.0025

S.E.Hunt, W.W.Jones, J.L.W.Churchill, D.A.Hancock, Proc. Phys. Soc. 67A, 443(1954); Phys. Rev. 89, 1283 (1953); Nature 172, 460 (1953).

β^+ 3.2 Mg(0.25-Mev p): a

(β^+)(1.0-to 2.5-Mev γ) ≤ (9 ± 8)%

S.E.Hunt, W.W.Jones, J.L.W.Churchill, Proc. Phys. Soc. 67A, 479 (1954).

Al^{26} 13 13 6.7^s

τ_1	6.5^S *1*	Al^{27}(13.4-Mev γ)
β^+	3.2	a

R.N.H.Haslam, W.N.Roberts, D.S.Robb, Can. J. Phys. 32, 361 (1954).

τ_1 6.68^S *11*

Resonances $Mg^{25}(p,\gamma)$ EA

E_o	Γ
0.3167 ?	0.012
0.3915 *5*	0.008
0.4956 *6*	0.005
0.5134 ?	0.003
0.5304 ?	0.003

S.E.Hunt, W.W.Jones, J.L.W.Churchill, D.A.Hancock, Proc. Phys. Soc. 67A, 443 (1954); Nature 172, 460 (1953).

Al^{26} 13 13 long

Level $Al^{27}(p,d)Al^{26}$ $E_p = 18$
g.s.? $l_n = 2$ p,d(θ)

J.B.Reynolds, K.G.Standing, Phys. Rev. 95, 639A (1954).

Levels $Si(d,\alpha)$ $E_d = 7$ s

g.s.	1.750
0.418	1.85 ?
1.052	2.064

Only T = 0 levels expected from this reaction
No level between g.s. and 0.42 (< 3% of g.s.)

C.P.Browne, Phys. Rev. 95, 860(1954).

Resonances $Mg^{25}(p,\gamma)$ $E_p = 0.2$ to 0.7

E_o	γ's	
0.315	18† 6.28	
0.389	8† 6.20	
0.436	6† 6.28	25† 6.77*
0.508	10† 6.38	
0.586	18† 6.43	
0.620	19† 6.50	

†Relative intensity in % of γ's with $E_\gamma > 1$
β^+ yield low at 0.436 resonance
*Suggest this γ to g.s.

J.C.Kluyver, C. van der Leun, P.M.Endt, Phys. Rev. 94, 1795 (1954).

Al^{27} 13 14 stable

Level $Al^{27}(p,d)Al^{26}$ $E_p = 18$
g.s. $l_n = 2$ See Al^{26}

J.B.Reynolds, K.G.Standing, Phys. Rev. 95, 639A (1954).

Levels $Al^{27}(n,n'\gamma)$ $E_n = 0.8$ to 2.7
γ 0.85 scin
1.03
2.23

Graphs of σ's from threshold to 2.7

R.M.Klehn, C.Goodman, Phys. Rev. 95, 989 (1954).

Levels $Mg^{26}(p,\gamma)$ $E_p = 0.3$ to 1.5

8.591	9.238
8.694	9.277
8.898	9.391
8.954	9.470
9.045	9.509
9.070	9.633
9.179	9.671
9.216	

L.N.Russell, W.E.Taylor, J.N.Cooper, Phys. Rev. 95, 99 (1954).

Al^{28} 13 15 2.3^m

β^- 2.8 Al^{27}(pile n); a
γ 1.83 scin
(2.8 β) (1.83 γ) $\beta\gamma/\beta$ not f(E_β)

M.E.Nahmias, J. phys. radium 15, 568 (1954); Compt. rend. 238, 1875 (1954).

Al^{28} 13 15 2.3^m

γ 1.77 d 21.4^{h}Mg chem scin

R.K.Sheline, N.R.Johnson, P.R.Bell, R.C.Davis, F.K.McGowan, Phys. Rev. 94, 1642(1954); 90, 325 (1953).

No 2.4 γ* (< 1% of 1.8 γ) $\beta\gamma$ scin
*Gentner, Maier-Leibnitz, unpublished

Th. Mayer-Kuckuk, Z. Naturf. 9A, 338(1954).

Levels $Al^{27}(d,p)$ $E_d = 4.31$ s

0.980	3.747?	5.396	6.641
1.597	3.934	5.643?	6.855
2.152	4.277	5.784	7.013
2.574	4.469	5.968	7.197
2.929	4.720	6.148	7.599?
3.334?	4.883	6.298	7.896?
3.520	5.170	6.438	

L.M.Khromchenko, Doklady Akad. Nauk SSSR 94, 1037 (1954).

Resonance $Al^{27}(n)$
0.0064 $\sigma_o = 88$ $\Gamma \sim 12$ ev $l_n = 1$

R.H.Rohrer, H.W.Newson, J.H.Gibbons, P.Cap, Phys. Rev. 95, 302A (1954).

Al^{29} 13 16 6.6^m

Mg(56-Mev α) chem
β^- ~25% 1.6 a$\beta\gamma$
γ 1.31 scin
2.42
(1.6 β) (2.42 γ)

M.E.Nahmias, A.H.Wapstra, J. phys. radium 15, 570 (1954); Compt. rend. 238, 1875 (1954).

Si^{27} 14 13 4.0^s

τ 4.0^s Si(≤70-Mev γ)
β^+ 3.76 scin

W.A.Hunt, R.M.Kline, D.J.Zaffarano, Phys. Rev. 95, 611A (1954).

Si^{28} 14 14 stable

γ $Al^{27}(p,\gamma)$ $E_p = 0.660$
(10.4) E1* D(γ,p) in ppl
*From polarization of γ-ray

I.S.Hughes, P.J.Grant, Proc. Phys. Soc. 67A, 481 (1954).

Si^{30} 14 16 stable

Levels $Al^{27}(\alpha,p)$ $E_\alpha \leq 5.3$ ppl

100†	g.s.
138†	2.27

†Relative numbers the same for both 13.2 and 13.5 level of P^{31}, q.v.
α,p(θ) for four proton groups given

R.R.Roy, J.Quéquin, P.Janssens, Bull. centre phys. nucléaire univ. libre Bruxelles, No. 31, (1951).

P^{28} 15 13 0.28^{s}

τ	0.29^{s}	S1(15.4-Mev p)	
β^+			scin
γ	1.78	5.5 ?	scin
	2.67	6.6	
	3.01 ?	7.1	
	4.3 ?	7.4 ?	
	4.6	7.7	
	4.89	8.1 ?	
	5.2 ?		
α/(> 1 Mev γ's) < 0.001			scin

S.W.Breckon, A.Henriksen, W.M.Martin, J.S.Foster, Can. J. Phys. 32, 223 (1954).

P^{30} 15 15 2.5^{m}

β^+	3.31*	P^{31}(≤ 70-Mev γ);	scin

W.A.Hunt, R.M.Kline, D.J.Zaffarano, Phys. Rev. 95, 611A (1954); *verbal report.

Capture γ's $Si^{29}(p,\gamma)$ scin

5.87 level E_p = 0.326

5.86

5.95 level E_p = 0.414

0.688

5.27

No other prominent resonances for $E_p \leq 0.700$

P.M.Endt, J.C.Kluyver, C. Van der Leun, Phys. Rev. 95, 580 (1954).

P^{31} 15 16 stable

Levels	$Al^{27}(\alpha,p)$	$E_\alpha \leq 5.3$	ppl
	13.2		
	13.5	See Si^{30}	

R.R.Roy, J.Duéquin, P.Janssens, Bull. centre phys. nucléaire univ. libre Bruxelles, No. 31 (1951).

P^{32} 15 17 14.3^{d}

$e^+/e^- < 10^{-6}$		trochoidal s
No $(e^+)(e^-) < 3\times10^{-5}$ per disintegration		sm*

*Path length 4.7 cm

P.Weinzierl, Z. Naturf. 9A, 69 (1954).

$e^+/e^- < 8\times10^{-6}$ s*

*Path length 6 cm

G.W.McClure, Phys. Rev. 94, 1637 (1954); 91, 483A (1953).

P^{33} 15 18 24.4^{d}

β^-	0.251	S(th n) chem 85% P^{33};s
		S(pile n) ms 70% P^{33}

B.Elbek, K.O.Nielsen, O.B.Nielsen, Phys. Rev. 95, 96 (1954).

S^{31} 16 15 2.4^{s}

τ	2.40^{s}	S(≤ 70-Mev γ)	
β^+	4.5		scin

W.A.Hunt, R.M.Kline, D.J.Zaffarano, Phys. Rev. 95, 611A (1954).

S^{33} 16 17 stable

q	-0.06	Mic

G.R.Bird, C.H.Townes, Phys. Rev. 94,1203(1954).

Cl^{32} 17 15 0.31^{s}

τ	0.32^{s}	S(14.5-Mev p)	
β^+			scin
γ	2.25		scin
	3.79 ?		
	4.33		
	4.82		
α/(> 1 Mev γ's) < 0.0005			scin

S.W.Breckon, A.Henriksen, W.M.Martin, J.S.Foster, Can. J. Phys. 32, 223 (1954).

Cl^{34} 17 17 32.4^{m}

No (0.145 γ)(β^+) No (0.145 γ)(γ)

Th. Mayer-Kuckuk, Z. Naturf. 9A, 338 (1954).

Cl^{36} 17 19 4.4x10^{5y}

Capture γ's	Cl(n,γ)		scin
	0.72		
	0.778		
(0.778 γ)(7.77 γ)	(1.15 γ)(7.42 γ)		
(1.59 γ)(6.98 γ)			

A.Recknagel, B.Hamermesh, Phys. Rev. 95, 650A (1954).

Cl^{38} 17 21 1.0^{s}

τ_1	1.0^{s}	Cl^{37}(pile n)
γ	0.66	scin

G.Scharff-Goldhaber, M.McKeown, Phys. Rev. 95, 613A (1954).

Cl^{38} 17 21 37.3^{m}

γ	(1.60)	$\tau < 4\times10^{-10}$s
(1.60 γ)(2.15 γ)(θ)		I = 3, 2, 0

J.J.Kraushaar, J.W.Wilhelich, A.W.Sunyar, Phys. Rev. 95, 456(1954).

A^{37} 18 19 34^{d}

Double K vacancy /K capture = 3.9×10^{-5} pc for e's with $E_e \leq 0.004$ (~73% of expected e's)

J.A.Miskel, M.L.Perlman, Phys. Rev. 94, 1683 (1954); 95, 612A (1954).

Intensity of low energy γ's in continuous γ spectrum is higher than that predicted for capture of $l = 0$ electrons. See theory which includes capture of $l = 1$ electrons [Phys. Rev. 95, 572 (1954)].

B.Saraf, Phys. Rev. 95, 612A (1954).

A^{41} 18 23 1.8^{h}

τ	1.80^{h}	V(187-Mev p)
Assignment confirmed with ms		No chem

G.Andersson, Phil. Mag. 45, 621 (1954).

K^{40} 19 21 1.3×10^{9y}

ϵ/β^- = 0.090 ms

Former value of 0.060* increased by more complete A extraction

M.A.Shillbeer, R.D.Russell, R.M.Farquhar, E.A.W.Jones, Phys. Rev. 94, 1793 (1954); *91, 1223 (1953).

K^{42} 19 23 12.5^h

τ 12.5^h V(187-Mev p)

Assignment confirmed with ms No chem

G.Andersson, Phil. Mag. 45, 621 (1954).

β^-	18.2%*	1.97	F-K linear ($<15\%$ $\Delta I=2$, yes shape)*	sl $\beta\gamma$
	81.8%*	3.56	$\Delta I=2$, yes shape	sl

L.Koerts, A.Schwarzschild, R.Gold, C.S.Wu, Phys. Rev. 95, 612A (1954); *verbal report.

γ	1.5†*	0.309	scin
	100†*	(1.51)	

N.H.Lazar, F.R.Bell, Phys. Rev. 95, 612A (1954); *verbal report.

K^{43} 19 24 22^h

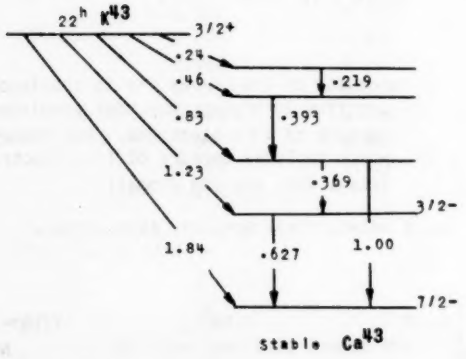
τ 22.4^h V(187-Mev p)

Assignment confirmed with ms No chem

G.Andersson, Phil. Mag. 45, 621 (1954).

τ 22.0^h A(~18-Mev α) chem

β^-	5%	0.24	sl
	5%	0.46	
	83%	0.83	
	5%	1.22	
	2%	1.84	$\Delta I=2$, yes shape
γ	1†	0.219	sl pe^-
	67†	0.369	
	6†	0.393	
	100†	0.627	$\alpha_K\sim2\times10^{-4}$
	4†	1.00	



T.Lindquist, A.C.G.Mitchell, Phys. Rev. 95, 444, 612A (1954).

K^{44} 19 25 22^m

τ 20^m V(187-Mev p)

Assignment confirmed with ms No chem

G.Andersson, Phil. Mag. 45, 621 (1954).

K^{45}? 19 26 34^m

τ 34^m V(187-Mev p), ms

Yield suggests element is K No chem

G.Andersson, Phil. Mag. 45, 621 (1954).

Ca^{39} 20 19 1.0^s

τ 0.90^s Ca($\leq$70-Mev γ)

β^+ 6.1 scin

W.A.Hunt, R.M.Kline, D.J.Zaffarano, Phys. Rev. 95, 611A (1954).

Ca^{41} 20 21 1.1×10^{5y}

τ 1.1×10^{5y}* 3 pc

Potassium x ray crit a

*Based on $\sigma_a(Ca^{40})$ = 0.22 and fluorescence yield = 0.13 Ca^{40}(pile n) chem

F.Brown, G.C.Hanna, L.Yaffe, Proc. Roy. Soc. 220A, 203 (1953); Phys. Rev. 84, 1243 (1951).

Ca^{43} 20 23 stable

I 7/2 s

μ -1.2

F.M.Kelley, H.Kuhn, A.Pery, Proc. Phys. Soc. 67A, 450 (1954).

Levels	Ca^{42}(d,p)	E_d = 5*	s
	0.38	1.00	
	0.61	1.40	

C.M.Braams, Phys. Rev. 95, 650A (1954); * verbal report.

Ca^{45} 20 25 164^d

Levels	Ca^{44}(d,p)	E_d = 5*	s
	0.18	2.84	
	1.43	2.96*	
	1.89	3.24*	
	2.25*	3.32*	
	2.40*	3.42*	

C.M.Braams, Phys. Rev. 95, 650A (1954); * verbal report.

Sc^{43} 21 22 4.0^h

τ 3.84^h V(187-Mev p)

Assignment confirmed with ms No chem

G.Andersson, Phil. Mag. 45, 621 (1954).

Sc^{44} 21 23 2.4^d

τ_1 2.46^d V(187-Mev p)

Assignment confirmed with ms No chem

G.Andersson, Phil. Mag. 45, 621 (1954).

Sc^{44} 21 23 4.0^h

τ_2 3.90^h V(187-Mev p)

Assignment confirmed with ms No chem

G.Andersson, Phil. Mag. 45, 621 (1954).

Sc^{47} 21 26 3.43^{d}

τ	3.3^{d}	V(187-Mev p)	
Assignment confirmed with ms		No chem	

G.Andersson, Phil. Mag. 45, 621 (1954).

Sc^{48} 21 27 1.83^{d}

τ	1.83^{d}	V(187-Mev p)	
Assignment confirmed with ms		No chem	

G.Andersson, Phil. Mag. 45, 621 (1954).

Ti

Capture γ's	Ti(n,γ)		scin
	0.334		
	1.06 to 1.10	2 unresolved γ's	
	1.39		
	1.53 to 1.58	2 unresolved γ's	
	1.75		

γ energy range observed 0.1 to 2.0

M.Reier, M.H.Shamos, Phys. Rev. 95, 636A (1954).

Ti^{45} 22 23 3.07^{h}

τ	3.0^{h}	V(187-Mev p)	
Assignment confirmed with ms		No chem	

G.Andersson, Phil. Mag. 45, 621 (1954).

Ti^{51} 22 29 5.8^{m}

γ	0.32		scin

Th. Mayer-Kuckuk, Z. Naturf. 9A, 338(1954).

V

Capture γ's	V(n,γ)		scin
	0.43		
	0.64		
	~0.82	2 unresolved γ's	

γ energy range observed 0.1 to 2.0

M.Reier, M.H.Shamos, Phys. Rev. 95, 636A (1954).

V^{47} 23 24 31.1^{m}

τ	33^{m}	V(187-Mev p)	
Assignment confirmed with ms		No chem	

G.Andersson, Phil. Mag. 45, 621 (1954).

V^{48} 23 25 16.2^{d}

τ	16.2^{d}	Ti(20-Mev α)

W.H.Burgus, G.A.Cowan, J.W.Hadley, W.Hess, T.Shull, W.L.Stevenson, H.F.York, Phys. Rev. 95, 750 (1954).

Cr

Capture γ's	Cr(n,γ)			scin
	0.740		1.07	
	0.815		2.13	

γ energy range observed 0.1 to 2.0

M.Reier, M.H.Shamos, Phys. Rev. 95,636A(1954).

Cr^{52} 24 28 stable

Level	Cr(n,n'γ)	E_n = 1.4 to 2.7	
	1.44		scin

Graph of σ from threshold to 2.7

R.W.Klehn, C.Goodman, Phys. Rev. 95, 989 (1954).

	Cr(n,n'γ)	E_n = 3.2	
γ	0.75		scin
	0.97		
	1.43		

(1.43 γ)($\sim$1.5-Mev n)

No (1.43γ)γ presumably because of low intensities of 0.75 γ and 0.97 γ

Assignment from agreement with 5.8^{d}Mn^{52} γ's

P.Shapiro, V.E.Scherrer, B.A.Allison, W.R.Faust, Phys. Rev. 95, 751 (1954).

Cr^{55} 24 31 3.5^{m}

τ	3.6^{m}	Mn^{55}(15-Mev d) Cr(th n)	chem
β^-	~2.8		a

G.A.Bazorgan, J.W.Irvine, Jr., C.D.Coryell, Phys. Rev. 95, 781 (1954).

Mn^{52} 25 27 5.8^{d}

τ_2	5.60^{d}	Cr(20-Mev d)

W.H.Burgus, G.A.Cowan, J.W.Hadley, W.Hess, T.Shull, W.L.Stevenson, H.F.York, Phys. Rev. 95, 750 (1954).

β^+/ϵ_K = 1.47 ± 0.03 (0.511 γ)(0.511 γ)/γ GM

R.Sehr, Z. Phys. 137, 523 (1954).

Mn^{55} 25 30 stable

	Mn^{55}(p,p'γ)	E_p = 0.550 to 2.40	
γ	0.133		scin

See also Fe^{55}?

H.Mark, C.McClelland, C.Goodman, Phys. Rev. 95, 628A (1954).

Mn^{56} 25 31 2.58^{h}

Capture γ's	Mn^{55}(n,γ)		scin
	0.098	0.266	
	0.206	0.308	

γ energy range observed 0.1 to 2.0

M.Reier, M.H.Shamos, Phys. Rev. 95, 636A (1954).

Resonances	Mn^{55}(n)	E_n = 100 to 1300 ev	
	350 ev	$\sigma_0\Gamma^2 = 3\times10^6$	chopper
	1120 ev		

F.G.P.Seidl, D.J.Hughes, H.Palevsky, J.S.Levin, W.Y.Kato, N.G.Sjöstrand, Phys. Rev. 95, 476 (1954).

Mn^{56} 25 31 2.58^h

Resonances $Mn^{55}(n)$ E_n = 0.2 to 10 kev

E_o(ev)	J	Γ(ev)*	
337	2 ?	22	chopper
1800	3 ?	14	
2360	3	360	

L.W.Bollinger, R.R.Palmer, D.A.Dahlberg, Phys. Rev. 95, 645A (1954); *verbal report.

Mn^{57} 25 32 1.7^m

τ		1.7^m	Fe^{57}(fast n)	chem
β^-		2.6		scin
γ	st	0.117		scin
	st	0.134		
	w	0.220		
	w	0.350		
	w	0.690		

No 7^d activity $\sigma(7^d)/\sigma(1.7^m) < 8\times10^{-4}$

B.L.Cohen, R.A.Charple, T.H.Handley, E.L.Olson Phys. Rev. 94, 953 (1954).

Fe γ's $Fe(n,n'\gamma)$ E_n = 3.3 scin

0.462	1.098	1.78
0.675	1.24	2.10
0.851	1.40	2.21
0.892	1.59	2.66
0.989	1.70	

D.L.Lafferty, L.A.Rayburn, T.W.Hahn, Phys. Rev. 95, 637A (1954).

Capture γ's $Fe(n,\gamma)$ scin

0.355

1.55 to 1.68 2 unresolved γ's

γ energy range observed 0.1 to 2.0

N.Reier, W.H.Shamos, Phys. Rev. 95, 636A(1954).

Fe^{55}? 26 29

$Mn^{55}(p,7\gamma)$ E_p = 2.12

γ	0.420	scin
	0.505	
	0.650	
	0.975	

H.Mark, C.McClelland, C.Goodman, Phys. Rev. 95, 628A (1954).

Fe^{56} 26 30 stable

Level $Fe(n,n'\gamma)$ E_n = 0.8 to 2.7

γ 0.85 scin

Graph of σ from threshold to 2.7

R.W.Klehn, C.Goodman, Phys. Rev. 95,989(1954); 93, 177 (1954).

Levels $Fe(n,n'\gamma)$ E_n = 4.3

0.85	2.7	ppl
2.1	3.0 ?	

B.Jennings, J.B.Weddell, R.L.Heilens, Phys. Rev. 95, 636A (1954).

Fe^{57} 26 31 stable

$Fe^{57}(\alpha,\alpha'\gamma)$ E_α = 1.2 to 3.2*

γ	0.014*	scin
	0.122	

N.P.Heydenburg, G.M.Temmer, Phys. Rev. 95, 629A (1954); *verbal report.

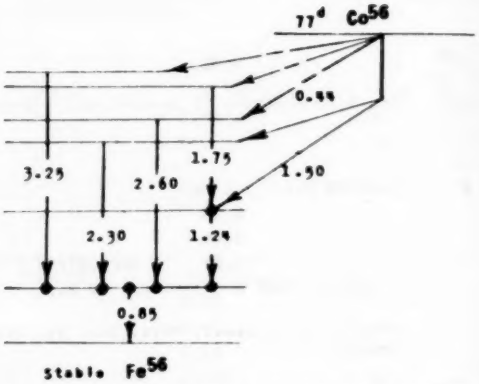
Co^{56} 27 29 77^d

τ 77.2^d Fe(20-Mev d)

W.H.Burgus, G.A.Cowan, J.W.Hadley, W.Hess, T.Shull, M.L.Stevenson, H.F.York, Phys. Rev. 95, 750 (1954).

β^+	4†*	0.44		sl
	96†*	1.50	Fe^{56}(10-Mev p)	chem
γ	100†	0.85		scin, sl pe$^-$
	55†	1.24		
	24†	1.75		
	12†	2.30		
	14†	2.60		
	24†	3.25		

(0.511 γ) (0.85 γ, 1.24 γ) (1.24 γ) (1.75 γ)
(0.85 γ) (1.24 γ, 1.75 γ,2.30 γ,2.60 γ,3.25 γ)
No (1.24 γ) (2.30 γ,2.60 γ,3.25 γ)
No (0.511 γ) (3.25 γ)
*Percent of all β^+



M.Sakai, J.L.Dick, W.S.Anderson, J.D.Kurbatov, Phys. Rev. 95, 101 (1954); 94, 779A (1954).

γ 0.846 sl pe$^-$

P.Macq, Ann. Soc. Sci. Bruxelles,67, 309 (1954).

Co^{57} 27 30 270^d

			α_K	K/LM	
γ	15†	0.123	0.011	~8	(M)1
	1†	0.138	0.14	~8	(E)2

Fe(d) chem sn/2

D.E.Alburger, M.A.Grace, Proc. Phys. Soc. 67A, 280 (1954).

Co^{60} 27 33 5.2^y

$\gamma\gamma(\theta)$ I = 4, 2, 0 b = 0.16

T.Wiedling, Arkiv Fysik 7, 69 (1954).

Co^{60} 27 33 5.2^{y}

Capture γ's $Co^{59}(n,\gamma)$ scin

0.237	0.82
0.289	1.48
0.65	1.82

γ energy range observed 0.1 to 2.0

W.Reier, M.H.Shamos, Phys. Rev. 95, 636A (1954).

Resonance $Co^{59}(n)$ E_n = 100 to 180 ev
134 ev $\sigma_o \sim 9700$ chopper
$\Gamma = 5.2$ $J = 3$

F.G.P.Seidl, D.J.Hughes, H.Palevsky, J.S.Levin, W.Y.Kato, N.G.Sjöstrand, Phys. Rev. 95, 476; 93, 931A (1954).

$Ni^{58?}$ 28 30 stable

Level $Ni(n,n'\gamma)$ E_n = 1.3 to 2.7
γ 1.47 scin
Graph of σ from threshold to 2.7

R.M.Klehn, C.Goodman, Phys. Rev. 95, 989(1954).

Ni^{59} 28 31 $7.5\times10^{4}y$

Levels $Ni(d,p)$ E_d = 3.0 ppl
g.s. I = 3/2- d,p(θ)
1.7 ?* I = 1/2-
*Or 1.3 Ni^{61} level

W.W.Pratt, Phys. Rev. 94, 1086 (1954).

Ni^{60} 28 32 stable

Level $Ni(n,n'\gamma)$ E_n = 1.3 to 2.7
γ 1.33 scin
Graph of σ from threshold to 2.7

R.M.Klehn, C.Goodman, Phys. Rev. 95,989(1954).

Ni^{61} 28 33 stable

Levels $Ni(d,p)$ E_d = 3.0 ppl
(0.66) I = 7/2- d,p(θ)
1.3 ?* I = 1/2-
*Or 1.7 Ni^{59} level

W.W.Pratt, Phys. Rev. 94, 1086 (1954).

Cu

Capture γ's $Cu(n,\gamma)$ scin

0.202
0.280

γ energy range observed 0.1 to 2.0

W.Reier, M.H.Shamos, Phys. Rev. 95,636A(1954).

$Cu(n,n'\gamma)$ E_n = 2.8

γ	1.67 ? scin
	2.42 ?

L.A.Rayburn, D.L.Lafferty, T.W.Hahn, Phys. Rev. 94, 1641 (1954); 95, 637A (1954).

$Cu(n,n'\gamma)$ E_n = 3.3
γ 2.19 n'γ scin

R.E.Garrett, F.L.Hereford, B.W.Sloope, Phys. Rev. 92, 1507 (1953); 91, 441A (1953).

Cu^{63} 29 34 stable

Levels $Cu(n,n'\gamma)$ E_n = 2.8
γ 0.96 scin
1.91
2.58 ?
Assignment from agreement with $38^{m}Zn^{63}$ γ's

L.A.Rayburn, D.L.Lafferty, T.W.Hahn, Phys. Rev. 94, 1641 (1954); 95, 637A (1954).

Level $Cu(n,n'\gamma)$ E_n = 3.3
γ 0.9 ? n'γ scin
Assignment from agreement with $38^{m}Zn^{63}$ γ

R.E.Garrett, F.L.Hereford, B.W.Sloope, Phys. Rev. 92, 1507 (1953); 91, 441A (1953).

Cu^{65} 29 36 stable

Level $Cu(n,n'\gamma)$ E_n = 2.8
γ 1.11 scin
Assignment from agreement with $2.56^{h}Ni^{65}$ γ

L.A.Rayburn, D.L.Lafferty, T.W.Hahn, Phys. Rev. 94, 1641 (1954); 95, 637A (1954).

Levels $Cu(n,n'\gamma)$ E_n = 3.3
γ 1.13 n'γ scin
1.53
Assignment from agreement with $2.56^{h}Ni^{65}$ γ's

R.E.Garrett, F.L.Hereford, B.W.Sloope, Phys. Rev. 92, 1507 (1953); 91, 441A (1953).

Zn^{65} 30 35 245^{d}

β^+	2.0%	(0.325)	(0.511 γ)/(1.11 γ)	GM
γ	47.5%	(1.11)		x γ/x
ϵ_{gs}	50.5%			

R.Sehr, Z. Phys. 137, 523 (1954).

Resonances $Zn^{64}(n)$ E_n = 0.15 to 10 kev chopper

E_o (ev)	Γ (ev)*	σ_o*
2750	75	945
4600	~60	565

D.A.Dahlberg, L.M.Bollinger, Phys. Rev. 95, 645A (1954); *verbal report.

Zn^{67} 30 37 stable

$Zn^{66}(n)$ E_n = 0.15 to 10 kev
No resonances observed

D.A.Dahlberg, L.M.Bollinger, Phys. Rev. 95, 645A (1954).

Zn^{68} 30 38 stable

Resonances $Zn^{67}(n)$ E_n = 0.15 to 10 kev chopper

E_o (ev)	Γ (ev)*	σ_o*
225	1.5	4350
455	13	2860
1620	~20	804
2300	~30	565

D.A.Dahlberg, L.M.Bollinger, Phys. Rev. 95, 645A (1954); *verbal report.

Zn^{69} 30 39 52^m

Resonance $Zn^{68}(n)$ E_n = 0.15 to 10 kev
530 ev Γ = 10 ev chopper
σ_o = 4910*

D.A.Dahlberg, L.M.Bollinger, Phys. Rev. 95, 645A (1954); *verbal report.

Zn^{71} 30 41 3^h

τ_1		3^h	Zn^{70}(pile n)
β^-		1.5	a$\beta\gamma$
γ_1		0.38	
γ_2		0.49	
γ_3		0.61	

(1.5 β) (0.38 γ, 0.49 γ, 0.61 γ)
(0.38 γ) (0.49 γ, 0.61 γ), (0.49 γ) (0.61 γ)

J.M.LeBlanc, J.M.Cork, S.B.Burson, Phys. Rev. 94, 1436A (1954).

Zn^{71} 30 41 2.2^m

τ_2		2.2^m	Zn^{70}(pile n)
β^-		2.4	a
γ	w	0.12	scin
		0.51	
	w	0.90	
	w	1.05	

(2.4 β) (0.51 γ)
No (0.51 γ) (0.12 γ)

J.M.LeBlanc, J.M.Cork, S.B.Burson, Phys. Rev. 94, 1436A (1954).

Ga^{70} 31 39 21.4^m

τ		21.37^m	Ga^{69}(th n)
β^-	0.3%	~0.4	scin$\beta\gamma$
	0.5%	~0.6	
γ		0.174	scin
		1.036	

(0.174 γ)(1.04 γ)(θ) I = 0, 2, 0
No 1.21 γ (< 2% of 0.174 γ)
(~0.4 β)(0.174 γ) (~0.6 β)(1.04 γ)

M.E.Bunker, J.W.Starner, J.P.Mize, Phys. Rev. 95, 612A (1954); verbal report.

Ge^{71} 32 39 11.4^d

Intensity of low energy γ's in continuous γ spectrum is higher than that predicted for capture of $l = 0$ electrons. See theory which includes capture of $l = 1$ electrons [Phys. Rev. 95, 572 (1954)].

B.Saraf, Phys. Rev. 95, 97, 612A (1954).

Ge^{75} 32 43 49^s

τ_1		49^s	Ge^{74}(pile n)
γ		0.139 K/L > 3	s ce$^-$, scin

No β^-

S.B.Burson, W.C.Jordan, J.M.LeBlanc, Phys. Rev. 95, 613A (1954).

Ge^{77} 32 45 52^s

τ_1		52^s	Ge^{76}(pile n)
β^-		2.7	a
γ	~100†	0.159	scin
	~100†	0.215	

(2.7 β) (0.215 γ) no $\gamma\gamma$ no β(0.159 γ)

S.B.Burson, W.C.Jordan, J.M.LeBlanc, Phys. Rev. 95, 613A (1954).

Ge^{77} 32 45 12^h

(0.210 γ) (0.265 γ) (0.215 γ) (0.410 γ)

S.B.Burson, W.C.Jordan, J.M.LeBlanc, Phys. Rev. 95, 613A (1954); verbal report.

Se^{79} 34 45 6.5×10^4y

q +0.9 Mlc
Calculated from data of Hardy et al., Phys. Rev. 85, 494 (1952).

G.R.Bird, C.H.Townes, Phys. Rev. 94, 1203 (1954).

Br^{77} 35 42 58^h

β^+/ϵ_K(g.s.) = 0.025
ϵ_K(g.s.)/ϵ_K(total) = 0.38 xγ/x GM
No $\beta^+\gamma$

R.Sehr, Z. Phys. 137, 523 (1954).

Br^{79} 35 44 stable

$\mu(Br^{81})/\mu(Br^{79})$ = 1.07794 M
q +0.33
$q(Br^{79})/q(Br^{81})$ = 1.19707

J.G.King, V.Jaccarino, Phys. Rev. 94, 1610 (1954); 91, 209A (1953).

$Br^{80?}$ 35 45 5.1^s

τ_1		5.1^s*	Br^{79}(pile n)
γ		0.21	scin

G.Scharff-Goldhaber, W.McKeown, Phys. Rev. 95, 613A (1954); *verbal report.

Br^{80} 35 45 18.5^m

β^-	~15†	1.38	Br^{79}(pile n); sl $\beta\gamma$
	~85†	2.0	sl

(1.38 β) (0.62 γ)

J.Laberrigue-Frolow, N.Marty, J. phys. radium 15, 584 (1954).

Br^{81} 35 46 stable

q +0.28 M

J.G.King, V.Jaccarino, Phys. Rev. 94, 1610 (1954); 91, 209A (1953).

Kr^{85} 36 49 4.4^h

γ	(0.150)	α_K = 0.040	sl
	(0.305)	α_K = 0.41	M4
$(ce_K^-$ 0.305 $\gamma)/(ce_K^-$ 0.150 $\gamma)$ = 1.8			sl
(0.150 γ)/(0.305 γ) = 5.7			scin

I.Bergström, S.Thulin, A.H.Wapstra, B.Aström, Arkiv Fysik 7, 255 (1954).

Rb^{86} 37 49 19.5^d

β^-	0.72		sl
	1.760	$\Delta I = 2$, yes shape	
γ	1.055	$\tau < 10^{-9}$s	sl pe$^-$

$\beta\gamma(\theta)$ b = 0.14

P.Macq, Ann. Soc. Scl. Bruxelles 67,309(1954).

Resonance Rb(pile n)19.5^{d}Rb ~970 ev B absorption

H.W.Newson, R.H.Rohrer, Phys. Rev. 94, 654 (1954); 87, 177A (1952).

Rb^{87} 37 50 6.2x10^{10}y

τ	6.1x10^{10}y*		
β^-	0.25		a

Excess of e^- (E_e-$\leq$0.012) assumed to be β's

No γ with $E_\gamma \geq 0.1$ a

No K x ray, L x ray No βe^-

*Based on 27.5% abundance

J.Flinta, S.Eklund, Arkiv Fysik 7,401(1954).

Rb^{88} 37 51 17.8^m

Resonance Rb(pile n)17.8^{m}Rb ~420 ev B absorption

H.W.Newson, R.H.Rohrer, Phys. Rev. 94,654(1954)

Y^{90} 39 51 64.6^h

Resonance Y^{89}(pile n)64.6^{h}Y ~5 kev B absorption

H.W.Newson, R.H.Rohrer, Phys. Rev. 94,654 (1954).

Y^{91} 39 52 57^d

β^-	0.33		$\beta\gamma$ scin
γ 0.3%	1.22		scin

No 0.2 γ (< 0.015%)

(0.33 β)(1.22 γ) No $\gamma\gamma$ U(n,f) chem

1.22 γ follows a 59^d half-life

M.E.Bunker, J.P.Mize, J.W.Starner, Phys. Rev. 94, 1694 (1954).

Nb^{89} 41 48 0.8^h

τ_1	0.8^h	Nb^{93}(50-Mev p)	
p 4.3^{m}Zr chem		Zr(40-Mev p)	chem

R.W.Diamond, Phys. Rev. 95, 410 (1954).

Nb^{89} 41 48 1.9^h

τ_2	1.9^h	Nb^{93}(50-Mev p)	
		Zr(40-Mev p)	chem
β^+	2.9		a

p 79^{h}Zr chem

R.W.Diamond, Phys. Rev. 95, 410 (1954).

Nb^{94} 41 53 2.7x10^{4}y

τ_2	2.7x10^{4}y	Nb^{93}(pile n)	chem
β^-	0.61		a

M.A.Rollier, E.Saeland, Phys. Rev. 94, 1079 (1954).

Tc^{93} 43 50 2.7^h

β^+/ϵ_K = 1.14 ± 0.01			GM
$\beta^+\gamma/\beta^+$ not f (E_β)			
All ϵ_K and β^+ to one level		$\beta^+\gamma/\beta^+$ = xγ/x	

R.Sehr, Z. Phys. 137, 523 (1954).

Tc^{97} 43 54 91^d

τ_1	91^d	Mo^{97}(19-Mev d)	chem
γ	0.095	K/LM = 1.7	sl ce$^-$
Tc K x rays			crit a

G.Boyd, Phys. Rev. 95, 113 (1954).

Tc^{97} 43 54 ~10^{5}y

τ_2	10^4-10^5y	Mo^{97}(19-Mev d)	chem
Mo K x rays			pc

G.Boyd, Phys. Rev. 95, 113 (1954).

Rh^{102} 45 57 210^d

β^+	4†	0.40	Ag(420-Mev p)chem;	sl
	21†	0.76		
	59†	1.24		
β^-	100†	1.15	F-K plot linear	
γ	> 92*	0.086	K/LM > 2.5	sl ce$^-$
	32*	0.124	K/LM ~ 7.5	
	10*	0.195		
	1.5*	0.353		
	3*	0.475		

*Conversion electrons per 100 β^-

L.Marquez, Phys. Rev. 95, 67 (1954).

Rh^{103} 45 58 stable

Levels	$Rh^{103}(\alpha,\alpha'\gamma)$	E_α = 6.0	
γ	0.295		scin
	0.357		

N.P.Heydenburg, G.M.Temmer, Phys. Rev. 95, 861; 93, 351 (1954).

Rh^{104} 45 59 44^s

Resonance Rh^{103}(n) cryst s

(1.26) ev σ_o = ~4850±200* Γ = 0.156

*Including Doppler correction found from $\sigma(E_n = 1.26$ ev) as f(T)

H.H.Landon, Phys. Rev. 94, 1215; 93, 931A (1954).

Pd^{109} 46 63 13.6^h

β^- 1.020 Pd(th n); sl

J.Moreau, J. Phys. radium 15, 380 (1954).

Ag^{103} 47 56 1.1^h

τ	1.1^h	Rd(12-Mev d)	chem
γ	0.554	K/LM ~ 5	sm/2 ce$^-$
	0.764		

W.L.Bendel, F.J.Shore, H.N.Brown, R.A.Becker, Phys. Rev. 90, 888 (1953).

τ	1.1^h	Ag(80-Mev p)	chem
		p 17^{d}Pd	chem
β^+	1.3		a

B.C.Haldar, E.O.Wiig, Phys. Rev. 94,1713(1954).

Ag^{107} 47 60 stable

Levels $Ag^{107}(\alpha,\alpha'\gamma)$ $E_\alpha = 6.0$

γ	0.318	scin
	0.413	

N.P.Heydenburg, G.M.Temmer, Phys. Rev. 95, 861 (1954).

Ag^{108} 47 61 2.3^m

Resonances $Ag^{107}(n)$ E_n = 2 to 100 ev chopper

E_o (ev)	$\sigma_o\Gamma^2$
16.6	60
42.4	50
45.6	8
52.2	140

F.G.P.Seidl, D.J.Hughes, H.Palevsky, J.S.Levin, W.Y.Kato, N.G.Sjöstrand, Phys. Rev. 95, 476 (1954).

Ag^{109} 47 62 40^s

γ 0.0875 $\alpha_K = 9.5$ E3 d 470^dCd
K/LM = 0.80 scin, slce$^-$

(K x ray)/(0.087 γ) = 34 scin

A.H.Wapstra, Arkiv Fysik 7, 265 (1954).

γ 0.0877 $\alpha_K \sim 6.4$ E3 d 13^hPd
K/LM = 0.84 sl ce$^-$

J.Moreau, J. Phys. radium 15, 380 (1954).

Ag^{109} 47 62 stable

Levels $Ag^{109}(\alpha,\alpha'\gamma)$ $E_\alpha = 6.0$

γ	0.305	scin
	0.400	

N.P.Heydenburg, G.M.Temmer, Phys. Rev. 95, 861 (1954).

Ag^{110} 47 63 24^s

τ_2		24^s	Ag(pile n)
β^-		2.16	scin
		2.84	
γ		0.66	scin
	W	0.72	
	W	0.81	
	W	0.88	
		0.94	
β/γ = 2*			scin

F.I.Boley, Phys. Rev. 94, 1078(1954); *priv. comm.

Resonances $Ag^{109}(n)$ E_n = 2 to 100 ev chopper

E_o (ev)	σ_o	Γ
5.22	27,000	0.168

$\sigma_o\Gamma^2$
52
30
100
150
20

F.G.P.Seidl, D.J.Hughes, H.Palevsky, J.S.Levin, W.Y.Kato, N.G.Sjöstrand, Phys. Rev. 95, 476 (1954).

Cd^{109} 48 61 470^d

(L x ray)/(K x ray) = 0.0505 Pc
(K x ray)/(0.085γ) ~ 18 scin
E_ϵ = 0.067 from ϵ_L/ϵ_K = 0.32 ± 0.04
E_{dis} = 0.067 + 0.087 (E_γ)

G.Bertolini, A.Bisi, E.Lazzarini, L.Zappa, Nuovo Cim. 11, 539 (1954).

In^{114} 49 65 72^s

(0.556 γ) (0.722 γ) Σ scin
No (1.30 γ) (0.556 γ)

D.C.Lu, W.H.Kelly, Phys. Rev. 95, 121 (1954).

In^{115} 49 66 6×10^{14}y

Magnetic octupole interaction observed M
Interaction constant = 0.000497 ± 33 Mc/sec

P.Kusch, T.G.Eck, Phys. Rev. 94, 1799 (1954).

In^{116} 49 67 13^s

β^- 3.29 In(pile n) scin
No γ

F.I.Boley, Phys. Rev. 94, 1078 (1954).

Sb^{124} 51 73 60^d

γ	100†	0.603	scin
	5.4†	0.99	
	6.2†	1.38	
	46†	1.71	
	10†	2.11	

W.M.Lazar, Phys. Rev. 95, 292 (1954).

Sb^{125} 51 74 ~2.7^y

β^-	29%	0.12	s
	45%	0.300	
	12%	0.444	
	14%	0.612	ΔI = 2, yes shape

(0.12 β) (~0.62γ) (0.44 β) (0.175 γ)
(0.30 β) (~0.45γ) (0.175 γ) (~0.45 γ)
No (0.61 β) (γ)

J.Moreau, Arkiv Fysik 7, 391 (1954).

(K x ray) (0.425 γ, 0.601 γ) 4πscin
No (0.176 γ) (K x ray, γ)

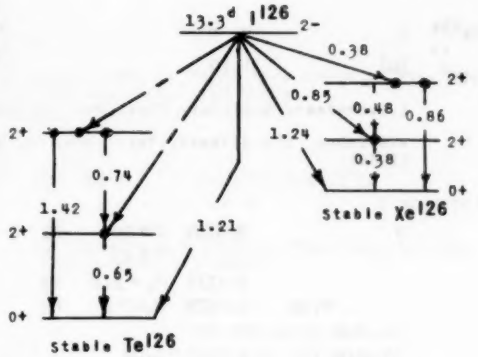
D.C.Lu, W.H.Kelly, M.L.Wiedenbeck, Phys. Rev. 95, 121 (1954).

I^{126} 53 73 13.3^d

τ		13.3^d	I^{127}(20-Mev n)		chem
β^+		1.19		scin β(0.511 γ)	
γ	320†	0.382	37†	0.74	scin
	31†	0.48	5.9†	0.86	
	310†	0.65	3.8†	1.42	

[x ray] [0.74 γ, 1.42 γ, ce$^-$ (0.38 γ), 0.85 β]
β(0.38 γ, ~0.5 γ) (0.38 γ) (0.48 γ, 0.85 β)
(0.65 γ) (x ray, 0.74 γ) (0.38 β) (0.86 γ)
No (x ray) (0.38 γ, 0.86 γ, 0.04 to 0.160 ce$^-$)
No γ (0.86 γ, 1.42 γ) No β(0.65 γ, 0.74 γ)
No (> 0.96 β) (≳ 0.511 γ)

$_{53}I^{126}_{73}$ 13.3^d



W.L.Perlman, J.Walker, Phys. Rev. 95, 133, 613A (1954).

$_{53}I^{127}_{74}$ stable

q -0.75 S

K.Murakawa, S.Suwa, Z. Phys. 137,575(1954).

Magnetic octupole moment = $\pm 0.3\ \mu_o$ barns M
Interaction constant = 0.00245 ± 37 Mc/sec

V.Jaccarino, J.G.King, R.A.Satten, H.H.Stroke, Phys. Rev. 94, 1798 (1953).

$_{53}I^{128}_{75}$ 25.0^m

Capture γ $I^{127}(n,\gamma)$ scin
0.255
γ energy range observed 0.1 to 2.0

M.Reier, M.H.Shamos, Phys. Rev. 95, 636A(1954).

Resonances $I^{127}(n)$ E_n = 15 to 100 ev chopper

E_o (ev)	$\sigma_o\Gamma^2$
20.5	10
31.4	100
37.7	180
46	80
66	~5
78	~80
91	~50

F.G.P.Seidl, D.J.Hughes H.Palevsky, J.S. Levin, W.Y.Kato, N.G.Sjöstrand, Phys. Rev. 95, 476 (1954).

$_{53}I^{129}_{76}$ 1.7×10^7y

β^- 0.150 ΔI = 2, no sl
γ 0.038 α_K = 22 pc
K/L~10 sl ce$^-$
No 0.188 β(<1%) 4π scin

E. der Mateosian, C.S.Wu, Phys. Rev. 95, 458 (1954); 91, 497A (1953).

$_{53}I^{131}_{78}$ 8.05^d

γ (0.080) Te(pile n) chem
K/L = 6.8 L/MN = 4.8
K/LM = 5.7

G.J.Nijgh, L.Th.M.Ornstein, N.Grobben, Physica 20, 243 (1954).

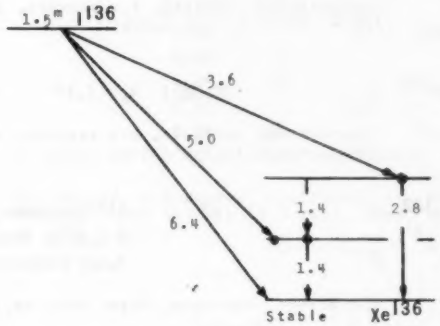
$_{53}I^{134}_{81}$ 53^m

β^- 1.5 d 44^mTe chem; $\beta\gamma$ scin
2.5
γ 0.120 ? scin
0.200 ?
0.86
1.10
1.78
(2.5 β) (0.86 γ) (1.5 β) (1.10 γ, 1.78 γ?)

W.McKeown, S.Katcoff, Phys. Rev. 94,965(1954).

$_{53}I^{136}_{83}$ 1.5^m

β^- 3.7 U(n,f)chem; $\beta\gamma$ scin
5.0
6.3 scin
γ s 1.38 scin
2.9
(5.0 β) (1.4 γ) (3.7 β) (2.9 γ)
(1.4 γ) (1.4 γ) No (6.3 β) (γ)



W.McKeown, S.Katcoff, Phys. Rev. 94, 965 (1954).

$_{54}Xe^{125}_{71}$ 55^s

τ_1 55^s d 45^mCs (~0.1%) recoil
γ IT? 0.075* scin
0.110

*Possibly Pb fluorescent radiation

H.B.Mathur, E.K.Hyde, Phys. Rev. 95, 708(1954).

$_{54}Xe^{125}_{71}$ 18^h

d 45^mCs recoil
γ 0.056 scin
0.187
0.243
(0.460)
(0.056 γ) (0.187 γ) No 0.511 γ
No (0.243 γ) (0.056 γ, 0.187 γ)
0.056 γ preceeds 0.187 γ $\gamma\gamma/\gamma$

H.B.Mathur, E.K.Hyde, Phys. Rev. 95,708(1954).

$_{54}Xe^{127}_{73}$ 75^s

d 6.3^hCs (0.01%) recoil
γ 0.125 Cf Cs^{127} scin
IT 0.175

H.B.Mathur, E.K.Hyde, Phys. Rev. 95,708(1954).

$Xe^{129}_{54\ 75}$ 8.0^d — Xe(pile n) ms

γ		0.0400	K/LM = 4.3	sl ce^-
		0.196	K/LM = 2.1	

$(ce^-_{LM}\ 0.040\gamma)/(ce^-_K\ 0.196\gamma) = 0.27$

S.Thulin, Arkiv. Fysik 7, 269 (1954).

γ	(0.196)	$\alpha_K = 11$	scin

I.Bergström, S.Thulin, A.H.Wapstra, B.Aström, Arkiv Fysik 7, 255 (1954).

$Xe^{131}_{54\ 77}$ 12.0^d

γ	(0.164)	$\alpha_K = 29$	x/γ	scin

I.Bergström, S.Thulin, A.H.Wapstra, B.Aström, Arkiv Fysik 7, 255 (1954).

$Xe^{133}_{54\ 79}$ 2.3^d

γ	(0.232)	$\alpha_K = 4.4$		scin
From $\alpha_K(0.232\ \gamma) = 3\ \alpha_K(0.081\ \gamma)$				sl, scin

I.Bergström, S.Thulin, A.H.Wapstra, B.Aström, Arkiv. Fysik 7, 255 (1954).

$Xe^{133}_{54\ 79}$ 5.27^d

γ	(0.081)	$\alpha_K = 1.47$	x/γ	scin

I.Bergström, S.Thulin, A.H.Wapstra, B.Aström, Arkiv Fysik 7, 255 (1954).

$Cs^{123}_{55\ 68}$ 6^m

τ	6^m	I^{127}(130-Mev α)	chem
		p $1.8^h Xe$ recoil	
β^+		0.511γ detected,	scin

H.B.Mathur, E.K.Hyde, Phys. Rev. 95,708(1954).

$Cs^{125}_{55\ 70}$ 45^m

τ	45^m	I^{127}(100-Mev α)	chems, ms	
β^+	2.05		sn/2	
γ	0.112	K/LM~3.6	sl ce^-	
(0.112 γ) (K x ray, 0.511 γ)				
p $55^s Xe$ ~0.1%	p $18^h Xe$ 100%		recoil	

H.B.Mathur, E.K.Hyde, Phys. Rev. 95,708(1954).

$Cs^{127}_{55\ 72}$ 6.3^h

τ		6.3^h	I^{127}(60-Mev α)	chem, ms
β^+		0.68		sl
		1.06		
γ	10†	0.125	K/LM = 7.9	sn/2 ce^-
	w	0.169 ?		
	w	0.196 ?		
	w	0.285 ?		
	w	0.363 ?		
	80†	0.406	K/LM = 6.3	
	vw	0.440		$\gamma\gamma$ scin

H.B.Mathur, E.K.Hyde, Phys. Rev. 95,708(1954).

(x ray) (0.125 γ, 0.406 γ, 0.440 γ)
(0.511 γ) (0.125 γ, 0.406 γ)
(0.125 γ) (0.440 γ)
No (0.125 γ) (0.406 γ)
$\epsilon_K/\beta^+ > 15$ scin
p $75^h Xe$ ~0.01% recoil

H.B.Mathur, E.K.Hyde, Phys. Rev. 95,708(1954).

$Cs^{134}_{55\ 79}$ 3.15^h

I	8		M
$\lvert\mu\rvert$	1.10		

L.S.Goodman, S.Wexler, Phys. Rev. 95,570(1954).

V.W.Cohen, D.A.Gilbert, Phys. Rev. 95, 569 (1954).

γ		0.0105	α~200, $\tau \lesssim 10^{-7s}$	M1 pc
		0.1271	$\alpha_K = 2.6$	E3 sn ce^-
	0.8%	0.1374	K/L~2	M4
(0.0105 γ) (0.1271 γ)				
(0.0105 γ) / (K x ray) ~0.02				pc

A.W.Sunyar, J.W.Mihelich, M.Goldhaber, Phys. Rev. 95, 570 (1954).

$Cs^{137}_{55\ 82}$ 33^y

β^-		0.526	$\Delta I = 2$, yes shape	sl

P.Macq, Ann. Soc. Sci. Bruxelles 67,309(1954).

$Ba^{137}_{56\ 81}$ 2.60^m — d $33^y Cs$

γ	0.662	$\alpha_K = 0.092$ M4	sn/2 ce^-
		K : L : MN = 58 : 10 : 2.2	

A.H.Wapstra, Arkiv. Fysik 7, 275 (1954).

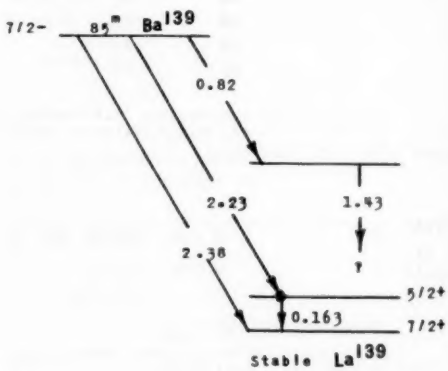
γ	0.6626 9	ce^-_K EA

S.K.Bhattacherjee, B.Waldman, W.C.Miller, Phys. Rev. 95, 404 (1954).

$Ba^{139}_{56\ 83}$ 85^m

β^-	19%	0.82	Ba(12-Mev d)chem; sl	
	66%	2.23		
	15%	2.38		
γ		0.163	$\alpha_K = 0.22$ M1	sl ce^-
			K/LM = 7.0	
		1.43		sl pe^-

(2.23 β) (0.163 γ)



A.C.G.Mitchell, E.Hebb, Phys. Rev. 95, 727 (1954).

γ	100†	0.165	$\alpha_K = 0.20$	scin
No 0.056 γ (< 0.2†)			Ba(d)	
No 0.275 γ (< 1†)				

R.M.Hussbaum, R. van Lieshout, Physica 20, 440 (1954).

$La^{139}_{57\ 82}$ stable

Q +0.9 S

K.Murakawa, J. Phys. Soc. Japan 9, 391(1954); Phys. Rev. 92, 325 (1953).

$La^{140}_{57\ 83}$ 40.2^h

Resonance La(pile n)40.2^hLa
76 ev B absorption

H.W.Newson, R.M.Rohrer, Phys. Rev. 94, 654 (1954); 87, 177A (1952).

$Pr^{142}_{59\ 83}$ 19.2^h

Resonance Pr^{141}(pile n)19.2^hPr
~380 ev B absorption

H.W.Newson, R.M.Rohrer, Phys. Rev. 94, 654 (1954).

Nd

Nd(α,αγ) E_α = 3.4

γ	0.070	scin
	0.128	
	0.290	

G.W.Temmer, N.P.Heydenburg, Phys. Rev. 94, 1399; 93, 906 (1954).

Sm

Sm(α,αγ) E_α = 3.4

γ	0.082	scin
	0.122	
	0.186	

G.W.Temmer, N.P.Heydenburg, Phys. Rev. 94, 1399; 93, 906 (1954).

$Sm^{150}_{62\ 88}$ stable

Resonance (ev) Sm(n) E_n = 0.07
(0.096) J = 4*

*From polarization of neutron beam transmitted by aligned Sm

L.D.Roberts, S.Bernstein, J.W.T.Dabbs, C.P.Stanford, Phys. Rev. 95, 105 (1954).

Eu

Eu(α,αγ) E_α = 3.4

γ	0.081	scin
	0.108	
	0.189	

G.W.Temmer, N.P.Heydenburg, Phys. Rev. 94, 1399 (1954).

Resonances Eu(n) E_n = 10 to 20 ev

10.6 ev	15.1	cryst s
11.8	~19.5	
12.8		

V.L.Sailor, H.H.Landon, H.L.Foote, Jr., Phys. Rev. 93, 1292 (1954).

$Eu^{152}_{63\ 89}$ 13^y

Resonances Eu(n) E_n = 0.08 to 10 ev

	E_o (ev)	σ_o	Γ (ev)	
0.24*	(-0.011)			cryst s
0.19*	0.327	4000	0.086	
0.11*	0.461	23200	0.096	
0.08*	1.055	3100	0.11	
		$\sigma_o\Gamma^2$	$\sigma_o\Gamma$	
	2.73		40	
~0.06*	3.35	110		
~0.06*	7.36	130		

*Yield ratio $9.2^h Eu/13^y Eu$

V.L.Sailor, H.H.Landon, H.L.Foote, Jr., Phys. Rev. 93, 1292 (1954); [a]R.E.Wood, Phys. Rev. 95, 453 (1954).

$Eu^{154}_{63\ 91}$ 16^y

Resonances Eu(n) E_n = 0.08 to 10 ev

E_o (ev)	$\sigma_o\Gamma^2$	$\sigma_o\Gamma$	
1.76		50	cryst s
2.46	90		
3.84	70		
6.25		180	
8.98	100		

No yield of $9.2^h Eu$ at these resonances*

V.L.Sailor, H.H.Landon, H.L.Foote, Jr., Phys. Rev. 93, 1292 (1954); [a]R.E.Wood, Phys. Rev. 95 453 (1954).

Dy

Dy(α,αγ) E_α = 3.4

γ	0.076	scin
	0.166	

G.W.Temmer, N.P.Heydenburg, Phys. Rev. 94, 1399 (1954).

$Dy^{165}_{66\ 99}$ 2.32^h

τ_2 2.38^h Dy(slow n)

E.R.Mayquez, Anales real soc. espan. fis.y quim. 50A, 95 (1954).

$Ho^{160}_{67\ 93}$ 23^m

τ ~22^m Dy(8.5-Mev p) chem
Not produced by Er(22-Mev p), Ho^{165}(22-Mev p)
Not d $3.6^h Er^{161}$

T.H.Handley, Phys. Rev. 94, 945 (1954).

$Ho^{161}_{67\ 94}$ 2.5^h

τ	2.5^h	d 3.6^hEr chem Er(24-Mev p),Dy(8.5-Mev p)
γ	0.090	scin
	0.17	
x	K x ray	

T.H.Handley, Phys. Rev. 94, 945(1954); 93, 524 (1954).

Ho^{162} 67 95 5.0^h

τ	5.0^h	Dy(8.5-Mev p)	chem
γ	0.19		scin
	0.71		
	0.95		
x	K x ray		

No 0.511 γ
Not produced by Ho^{165} (22.5-Mev p), Er(p)
No 65^d activity found

T.H.Handley, Phys. Rev. 94, 945 (1954).

Ho^{163} 67 96 ?

τ	$< 10^m$ or $> 20^y$	d 75^mEr	chem
		Dy(20-Mev p), Er(p)	chem

No 5^d activity

T.H.Handley, Phys. Rev. 94, 945 (1954); 92, 1260 (1953).

Ho^{164} 67 97 41^m

τ	41^m	Dy(p), Ho(p), Er(p)	chem
β^-	0.9		a
x	K x ray ?		scin

T.H.Handley, Phys. Rev. 94, 945 (1954).

Ho^{165} 67 98 stable

	$Ho^{165}(\alpha,\alpha'\gamma)$	$E_\alpha = 3.4$	
γ	0.093		scin
	0.205		

G.W.Temmer, N.P.Heydenburg, Phys. Rev. 94, 1399 (1954).

Er

	Er$(\alpha,\alpha'\gamma)$	$E_\alpha = 3.4$	
γ	0.079		scin
	0.174		

G.W.Temmer, N.P.Heydenburg, Phys. Rev. 94, 1399 (1954).

Tm^{167} 69 98 9.6^d

τ	9.4^d	d 18.5^mYb	chem

T.H.Handley, E.L.Olson, Phys. Rev. 94,968 (1954).

Tm^{168} 69 99 87^d

τ	87^d	Tm^{169}(24-Mev p)	chem

T.H.Handley, E.L.Olson, Phys. Rev. 94, 968 (1954).

Tm^{170} 69 101 127^d

γ	(0.084)	$\alpha_K = 1.6$	K/γ	scin

Electromagnetic spectrum given for source thickness from 0 to 1.0 g/cm^2

K.Linden, N.Starfelt, Arkiv Fysik 7,109(1954).

Yb

	Yb$(\alpha,\alpha'\gamma)$	$E_\alpha = 3.4$	
γ	0.081		scin
	0.114		
	0.180		

G.W.Temmer, N.P.Heydenburg, Phys. Rev. 94, 1399; 93, 351 (1954).

Yb^{167} 70 97 18.5^m

τ	18.5^m	Tm^{169}(19.0-Mev p)	chem
		p 9.6^dTm	scin
γ	0.118		scin
	0.18 ?		
	0.33 ?		
x	K x ray		

No 73^m Yb or Tm activity

T.H.Handley, E.L.Olson, Phys. Rev. 94, 968 (1954).

Yb^{169} 70 99 31.8^d

τ	33^d	Tm^{169}(24-Mev p)	chem

T.H.Handley, E.L.Olson, Phys. Rev. 94, 968 (1954).

Lu

	Lu$(\alpha,\alpha'\gamma)$	$E_\alpha = 3.4$	
γ	0.113		scin
	0.183		
	0.248		

G.W.Temmer, N.P.Heydenburg, Phys. Rev. 94, 1399; 93, 906 (1954).

Lu^{176} 71 105 $2.4\times10^{10}y$

τ_2	$4.56\times10^{10}y$ 30			
β^-	0.43			pc
γ	(0.089)			pc
100†	0.19		E2*	scin
100†	0.31		E2 or E1*	

(0.089 γ)(0.19 γ, 0.31 γ) (0.19 γ)(0.31 γ)
$\epsilon/\beta^- = 0.03$ *From ce^-/β pc

D.Dixon, A.McNair, S.C.Curran, Phil. Mag. 45, 683 (1954).

τ_2	$2.35\times10^{10}y$ 25*		
0.6†	0.089		scin
3.3†	0.203		
3.7†	0.306		

$\epsilon/\beta^- < 0.1$ assuming x rays from conversion of E2 γ's

J.A.Arnold, Phys. Rev. 93, 743(1954); *priv. comm.

Hf

	Hf$(\alpha,\alpha'\gamma)$	$E_\alpha = 3.4$	
γ	0.093		scin
	0.112		
	0.250		

G.W.Temmer, N.P.Heydenburg, Phys. Rev. 94, 1399 (1954); 93, 906 (1954).

Ta^{181} 73 108 stable

γ	$Ta^{181}(p,p'\gamma)$	$E_p = 2$ to 4		scin
	0.137	I = 9/2		p,$\gamma(\theta)$
		E2/M1 < 0.05		
17†	0.166			
10†	0.303	I = 11/2		p,$\gamma(\theta)$

(0.137γ)(0.166γ)

W.L.Goldburg, R.W.Williamson, Phys. Rev. 94, 747A (1954); 95, 629A, 767 (1954).

Ta^{181} 73 108 stable

γ	$Ta^{181}(\alpha,\alpha'\gamma)$	$E_\alpha = 3.4$	
	0.137		scin
	0.167		
	0.303		

G.W.Temmer, N.P.Heydenburg, Phys. Rev. 94, 1399; 93, 351 (1954).

Ta^{182} 73 109 111^d

β^-		0.510*	Ta^{181}(pile n); sl			
γ	w	0.03336	sl ce$^-$, cryst			
	w	0.04271	α_K	α_{L1}	α_{L2}	α_{L3}
	9†	0.06571		2.8	0.4	0.23
	100†	0.06774		0.17	0.07	0.07
	6†	0.08467		1.85	0.6	0.5
	46†	0.10009	1.5	0.13	1.4	1.35
	9†	0.11366	1.75	0.38	0.07	
	2†	0.11640				
	43†	0.15241	0.07			
	14†	0.15637	small			
	19†	0.17936	0.41	0.17		0.05
	9†	0.19831	0.24		0.11	0.07
	45†	0.22205	0.06	0.01		
	24†	0.22927	0.16		0.05	0.03
	27†	0.26409	0.11		0.04	0.02
		0.927				
		0.960		K/L		
		1.003		7.0		
	120†	1.122	0.005	6.7		
	8†	1.155	0.004			
	56†	1.189	0.006	6.5		
	115†	1.222	0.003	6.0		
	58†	1.231	0.003			
		1.298		6.6		
		1.375				
		1.437				
		1.454				

*Evidence for at least two lower energy β's
Decay scheme proposed

F.Boehm, P.Marmier, J.W.M.DuMond, Phys. Rev. 95, 864 (1954).

Re^{187} 75 112 $<10^{11}$y

τ	$<10^{11}$y	0.14 counts/min/cm^2	
β^-	<0.008		a

A.D.Suttle, Jr., W.F.Libby, Phys. Rev. 95,866 (1954).

Os^{189} 76 113 stable

I	3/2	OsO_4	I
μ	+0.65066		
$\nu(Os^{189})/\nu(Cl^{35}) = 0.79190$ 9		$TiCl_4$	

H.R.Loeliger, L.R.Series, Phys. Rev. 95, 291 (1954).

Ir

	$Ir(\alpha,\alpha'\gamma)$	$E_\alpha = 3.4$	
γ	0.133		scin
	0.219		
	0.360		

G.W.Temmer, N.P.Heydenburg, Phys. Rev. 94, 1399; 93, 906 (1954).

Ir^{192} 77 115 74.4^d

γ	0.9†	0.788	scin
	1.9†	0.883	
	w	0.92 ?	
	0.4†	1.080	
	0.07†	1.210	

E_{d_1s}(Ir-Pt) = 1.49± 0.02 4π scin

†Percent of the 0.606 γ + 0.613 γ peak

R.W.Pringle, W.Turchinetz, H.W.Taylor, Phys. Rev. 95, 115 (1954); 87, 930 (1952).

Pt^{191} 78 113 3.0^d

τ	2.90^d 5	Pt^{190}(pile n)	
γ	0.0737 ?		4π ce$^-$
	0.0826	$L_1L_2/L_3 = 1.6$	
	0.0964	K/L_1 ~2	0.360 K/L_1 ~7
	0.1296	~3	0.409 >10
	0.1723	~5	0.456 ~9
	0.1784		0.539 ~7
	0.2197		0.550
	0.2684		0.623
	0.3509	~9	

No 0.042 γ, 0.062 γ, 0.125 γ
(0.172 γ) (0.082 γ, 0.096 γ, 0.178 γ)
No (0.172 γ) ($\geq$ 0.350γ)

J.M.Cork, M.K.Brice, L.C.Schmid, G.D.Hickman, H.Nine, Phys. Rev. 94, 1218 (1954).

Pt^{193} 78 115 3.4^d

τ_1		3.4^d		Pt^{192}(pile n)	
γ	IT	0.1355	$K/L_1 = 0.25$		4π ce$^-$
			$L_3/L_1 = 1.5$		
		~1.6 ?			scin

J.M.Cork, M.K.Brice, L.C.Schmid, G.D.Hickman, H.Nine, Phys. Rev. 94, 1218 (1954).

Pt^{194}? 78 116 stable

	$Pt(p,p'\gamma)$	$E_p = 2.46$	
γ	0.215		
	0.330		

C.L.McClelland, C.Goodman, Phys. Rev. 94, 1437A (1954).

Pt^{195} 78 117 ~6^d

τ	~6^d	Pt^{194}(pile n)	
γ	0.0311	L_1 : M = 32 : 5	4π ce$^-$
	0.0991		
		K : L_1 : L_3 : M = 23 : 13 : 1 : 5	
IT	0.1299*		
		K : L_1 : L_3 = 10 : 50 : 85	

(0.031 γ) (0.099γ, x ray) (x ray) (x ray)
*Not crossover γ since not found in Au^{195} decay

J.M.Cork, M.K.Brice, L.C.Schmid, G.D.Hickman, H.Nine, Phys. Rev. 94, 1218 (1954).

Au^{195} 79 116 185^d

γ	0.099		scin
	0.145		
		d 40^hHg	chem

C.M.Braden, L.O.Wyly, E.T.Patronis, Jr., Phys. Rev. 95, 758 (1954).

Au^{197} 79 118 stable

γ — $Au^{197}(p,p'\gamma)$ E_p = 2 to 4

0.195			scin
0.277	I = 5/2 E2/M1 ~ 0.07		p,$\gamma(\theta)$
0.545	I = 7/2		p,$\gamma(\theta)$

No 0.268 γ

No (0.545 γ)(0.195 γ, 0.277 γ)

W.I.Goldburg, R.W.Williamson, Phys. Rev. 94, 747A (1954); 95, 629A, 767 (1954).

Au^{198} 79 119 2.70^d

τ — 2.699^d 3 — Au^{197}(th n) ic

No Au^{199} present < 0.2%

Counted for 10 half-lives — β electroscope

R.E.Bell, L.Yaffe, Can. J. Phys. 32, 416(1954).

Capture γ — $Au^{197}(n,\gamma)$ scin

0.248

γ energy range observed 0.1 to 2.0

W.Reier, W.H.Shamos, Phys. Rev. 95, 636A(1954).

Resonances — Au^{197}(n) E_n = 3 to 200 ev

E_o (ev)	σ_o	Γ	
4.94	31,000	0.16	chopper

	$\sigma_o\Gamma^2$
62	500
80	30
110	12
153	~70
168	170
194	~60

F.G.P.Seidl, D.J.Hughes, H.Palevsky, J.S.Levin, W.Y.Kato, N.G.Sjöstrand, Phys. Rev. 95, 476 (1954).

Hg^{195} 80 115 40^h

τ — 42^h — Au^{197}(20-Mev p) chem

γ

s	0.26	p 185^{d}Au	scin
w	0.58		
w	0.81		
vw	1.17		

No 0.511 γ

(K x ray)(0.26 γ, 0.58 γ, 0.81 γ)

No (0.26 γ)(0.58 γ)

C.H.Braden, L.O.Wyly, E.T.Patronis, Jr., Phys. Rev. 95, 627A, 758 (1954).

Hg^{197} 80 117 23^h

τ_1 — 24^h 1 — Au^{197}(12-Mev p) chem

γ

0.133	scin
0.279*	
0.58 ?	

*0.279 γ follows a 29^h ± 2 half-life ?

C.H.Braden, L.O.Wyly, E.T.Patronis, Jr., Phys. Rev. 95, 627A, 758(1954).

Hg^{198} 80 118 stable

Level — Hg(γ,γ') E_γ = 0.411

(0.411) $\tau = 3.3\times10^{-11}$s

Source heated to compensate for recoil

F.R.Metzger, W.B.Todd, Phys. Rev. 95,853(1954).

Hg^{203} 80 123 47^d

β^- — 0.210 — Hg(pile n) ms; sl

γ — 0.279 — α_K = 0.15 E2,M1 slce$^-$ K/LM = 2.8

S.Thulin, K.Nybö, Arkiv Fysik 7, 289 (1954).

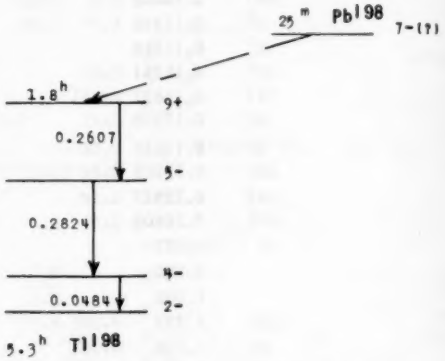
Tl^{198} 81 117 1.8^h

γ — Au^{197}(30-Mev α) chem

95*	0.0484	α > 10 E2	sn/2 ce$^-$
		$L_1:L_2:L_3:MN$ = <1.5:3.7:34:24	
100*	(0.2607)	M4	
		$K:L_1:L_3:MN$ = 44 : 26:18:12	
21*	(0.2824)	K/L_1 = 9	

(K x ray)(0.282 γ)

*Relative intensity of ce$^-$



T.O.Passell, W.C.Michel, I.Bergström, Phys. Rev. 95, 999 (1954).

Tl^{203} 81 122 stable

Level — Tl(γ,γ') E_γ = 0.280

(0.280) $\tau \sim 1\times10^{-9}$s

Source heated to compensate for recoil

F.R.Metzger, W.B.Todd, Phys. Rev. 95,627A (1954).

Tl^{204} 81 123 ~4^y

Tl(pile n)

β^- — 0.77 — ΔI = 2 yes, shape sl

$\epsilon_K/\beta^- \sim 0.05$ from $e_K/\beta^- = 0.003$

T.Yuasa, J.Laberrigue-Frolow, L.Feuvrais, Compt. rend. 238, 1500 (1954).

Tl^{206} 81 125 4.19^m

Resonance — Tl(pile n)4.19^{m}Tl

~10 kev — B absorption

H.W.Newson, R.H.Rohrer, Phys. Rev. 94, 654 (1954).

Tl^{208} 81 127 3.1^m

γ

0.5108 3	d 10.6^{h}Pb; sl ce$^-$	
2.614 2		

Hρ (L) = 2606.9 ± 1.0

Hρ (x) = 9985 ± 5.0

D.I.Meyer, F.W.Schmidt, Phys. Rev. 94, 927 (1954).

Pb^{203} 82 121 52^h

Tl(14-Mev d) chem

γ	120†	0.280	K/LM = 2.5	scin
	5†	0.403	α_K = 0.076	K/LM = 3.7
			E2 75%*	$\gamma\gamma(\theta)$
	1†	0.683		

No 0.153 γ (< 3†)
(0.403 γ) (0.280 γ) (θ) I = 5/2, 3/2, 1/2
(x ray) (0.683 γ)
No ϵ to ground state (< 2%) (xx) (0.28γ)/(xγ)x
*Based on 75% E2 for 0.280 γ

J.Varma, Phys. Rev. 94, 1688, 795A (1954); J. Franklin Inst. 257, 247 (1954).

Pb^{204} 82 122 68^m

g(3×10^{-7}s level) = + 0.04 ± 0.02 $\gamma\gamma(\theta,H)$

V.Krohn, S.Raboy, Phys. Rev. 95, 608A (1954).

Pb^{206} 82 124 stable

Level Pb(n,n'γ) E_n = 1.2 to 2.7
γ 0.81 scin
Graph of σ given

R.W.Kiehn, C.Goodman, Phys. Rev. 95,989(1954).

Pb^{212} 82 130 10.6^h

γ 0.23863 δ sl ce$^-$
Hρ (F)= 1388.56 ± 0.21
Γ(e^-_K 0.238 γ) ~ 50 ev
H determined (2-20 kev) with e^- accelerated through known potential

D.I.Meyer, F.H.Schmidt, Phys. Rev. 94, 927 (1954); 89, 908A (1953).

Bi^{207} 83 124 $\sim30^y$

Pb(27-Mev d) chem

γ	100†	0.565	α_K = 0.018 E2	sl ce$^-$
			K/LM = 3.0	scin
	74†	1.060	α_K = 0.113 M4	
			K/LM = 3.4	
x	~80†	K x ray		

e_A : (ce$^-$ 0.56 γ) : (ce$^-$ 1.06 γ) = 14 : 23 : 100
p 0.82^{s}Pb 80 ± 11%

A.H.Wapstra, Arkiv Fysik 7, 279 (1954).

Bi^{209} 83 126 stable?

Levels Bi^{209}(n,n'γ) E_n = 0.8 to 2.7
γ 0.90 scin
1.56
Graph of σ from threshold to 2.7

R.W.Kiehn, C.Goodman, Phys. Rev. 95, 989, 636A (1954).

Bi^{210} 83 127 2.6×10^6y

Resonances Bi^{209}(n) E_n = 0.2 to 13 kev fast chopper

E_o(kev)	Γ(ev)	
0.810	5.3	s wave
2.37	19	s wave
13*		

L.W.Bollinger, R.R.Palmer, D.A.Dahlberg, Phys. Rev. 95, 645A (1954); *verbal report.

Bi^{211} 83 128 2.16^m

τ 2.15^m Pb^{208}(28-Mev α) chem

F.N.Spiess, Phys. Rev. 94, 1292 (1954).

Bi^{212} 83 129 60.5^m

γ 0.03985* 5 d 10.6^hPb sl ce$^-$
*Assuming L_1 conversion
Hρ (A)= 534.11 ± 0.22

D.I.Meyer, F.H.Schmidt, Phys. Rev. 94, 927 (1954).

Bi^{214} 83 131 19.7^m

γ (1.414) s ce$^-$

K	:	L_1	:	L_2	:	L_3	:	M
530	:	100	:	< 20	:	< 5	:	25

L ratio limits consistent with theory for 0 to 0 decay

D.E.Alburger, A.Hedgran, Arkiv Fysik 7, 429 (1954).

Po^{209} 84 125 ~200^y

γ	~75†	0.270	Bi^{209}(20-Mev p) scin
	~75†	0.570	
	~75†	0.865	

(0.270 γ) (0.570 γ)
γ's assigned to Po^{209} since no γ known in Po^{208}
†Photons per 10^4 α's

E.H.Daggett, G.R.Grove, Phys. Rev. 95, 627A (1954).

Po^{210}? 84 126 138.4^d

In addition to g.s. α's (range 20 μ in ppl), 8500 tracks (not electrons) with ranges ≤ 300μ were observed from Po source

M.Ader, J. phys. radium 15, 60 (1954).

Po^{211} 84 127 0.52^s

τ_1	0.52^s	d 7.5^{h}At	chem
		Pb^{208}(18-Mev α)	chem
α	(7.43)		ic

Long range α ? ~9

F.N.Spiess, Phys. Rev. 94, 1292 (1954).

Po^{211} 84 127 25^s

τ_2	25^s	Pb^{208}(18-Mev α)	chem
α	7.14		ic

Not d 7.5^{h}At (< 0.01%)

F.N.Spiess, Phys. Rev. 94, 1292 (1954).

Po^{212}? 84 128 $0.30^{\mu s}$

In addition to g.s. and long range α's (ranges 48-60 μ in ppl), observed several hundred tracks (not electrons) fanning out from ThB source with ranges ≤ 352 μ

M.Ader, J. phys. radium 15, 583(1954); Compt. rend. 238, 1215 (1954).

At^{210} 85 125 8.3^h

γ (0.0464) $\tau = 1.52\times10^{-9}$ scin
0.046 γ emitted from 1.58 level in Po^{210}*

A.W.Sunyar, Phys. Rev. 95, 626A (1954); *verbal report.

Fr^{223} 87 136 21^m

β^-		1.15	d 22^yAc chem;	scin
γ	40†	0.0498		scin
	24†	0.080		
	~3†	0.215		
	~0.8†	0.310		
x		L x rays		pc

No (0.0498γ)(0.080γ, 0.215 γ, L x ray)
No (0.215γ)(0.080γ)
No other γ (< 0.04†)
†Photons per 100 disintegrations

E.K.Hyde, Phys. Rev. 94, 1221 (1954).

Ra^{224} 88 136 3.64^d

(5.45 α)(0.241 γ)(θ) I = 0, 2, 0 scin

J.C.D.Milton, J.S.Fraser, Phys. Rev. 95, 628A (1954).

Ra^{226} 88 138 1620^y

(4.61 α)(0.186 γ)(θ) I = 0, 2, 0 scin

J.C.D.Milton, J.S.Fraser, Phys. Rev. 95, 628A (1954).

Th^{227} 90 137 18.6^d

γ	0.0498	d 22^yAc chem;	pc
	0.087		scin
	~0.14 ?		
	0.235		

(0.050 γ)(0.087 γ?, 0.14 γ?, 0.235 γ)
†Photons per 100 disintegrations

E.K.Hyde, Phys. Rev. 94, 1221 (1954).

Th^{233} 90 143 23.5^m

Resonances Th^{232}(n) E_n = 5 to 140 ev chopper

E_o (ev)	$\sigma_o\Gamma$
22.1	7
23.8	13
61	10
71	120
117	7
127	20
133	10

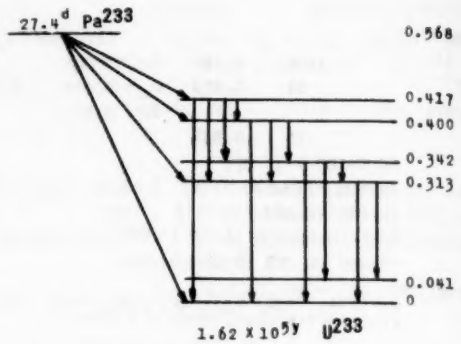
F.G.P.Seidl, D.J.Hughes, M.Palevsky, J.S.Levin, W.Y.Kato, N.G.Sjöstrand, Phys. Rev. 95, 476 (1954).

Pa^{233} 91 142 27.4^d

β^-	~50%	~0.14	Th^{232}(n,$\gamma\beta$) chem;	sl
	~45%	0.256		
	~ 5%	0.568		
γ		0.0172	v.w.	0.272 ?
	12†	0.0287	5†	0.301
	5†	0.0407	125†	0.313
	4†	0.058	10†	0.342
	22†	0.076		0.400
	17†	0.087		0.417
	12†	0.104		

0.474 γ too weak to observe if present
No 0.377 γ
†Relative intensity of ce^-

Pa^{233} 91 142 27.4^d



W.D.Brodie, Proc. Phys. Soc. 67A, 397 (1954).

Pa^{234} 91 143 1.18^m

γ	0.7†	0.758	scin
	1.0†	0.998	
	0.03†	1.49	
	0.03†	1.7	
	0.1†	1.84	

No 0.80 γ (< 0.002†)
No (0.758 γ)(0.998 γ)
No γ with 0.3 < E_γ < 0.7 (< 0.1†)
†Photons per disintegration

W.G.Cross, T.A.Eastwood, Phys. Rev. 95, 628A (1954).

U^{234} 92 142 $2.52x10^5y$

(α)(ce^-) delay < $1.4x10^{-9}$s scin

D.Engelkemeir, L.B.Magnusson, Phys. Rev. 94, 1395 (1954).

U^{239} 92 147 23.5^m

Resonance U(n) chopper
6.70 ev σ_o = 23400*
Γ = 0.0256 ev*
Γ_γ = 0.024 ev*

J.S.Levin, D.J.Hughes, Phys. Rev. 95, 645A (1954); *verbal report.

Np^{237} 93 144 $2.2x10^6y$

α(< 0.1 ce^-)delay = 3.69×10^{-8}s scin
Delay probably in level at 0.087

D.Engelkemeir, L.B.Magnusson, Phys. Rev. 94, 1395 (1954).

Pu^{238} 94 144 90^y

(5.452 α)(0.044 γ) I = 0, 2, 0 scin

J.C.D.Milton, J.S.Fraser, Phys. Rev. 95, 628A (1954).

Pu^{239} 94 145 $2.4x10^4y$

I	1/2	para
$\lvert\mu\rvert$	0.5	

B.Bleaney, P.M.Llewellyn, M.H.L.Pryce, G.R.Hall, Phil. Mag. 45, 773 (1954).

Am^{244} 95 149 26^m

τ	26^m	Am^{243}(pile n)	chem
β^-	1.5		scin
No prominent γ's			scin

A.Ghiorso, S.G.Thompson, G.R.Choppin, B.G.Harvey, Phys. Rev. 94, 1081 (1954).

Cm^{242} 96 146 162^d

τ 163^d 2 microcalorimeter
Counted over 12 month period

W.P.Hutchinson, A.G.White, Nature 173, 1238 (1954).

τ 162.5^d 3 ic
Counted over 7 month period

K.M.Glover, J.Milsted, Nature 173, 1238(1954).

Cm^{244} 96 148 19^y

τ 19.2^y Pu(pile n) chem ms
α activity compared to Cm^{242} ($\tau = 162.5^d$)

C.M.Stevens, M.H.Studier, P.R.Fields, J.F.Mech, P.A.Sellers, A.M.Friedman, H.Diamond, J.R.Huizenga, Phys. Rev. 94, 974 (1954).

Cm^{247} 96 151 $>60^d$

τ $>60^d$ Pn(pile n) chem ms
Cm^{244}/Cm^{247} constant over 20 day interval

C.M.Stevens, M.H.Studier, P.R.Fields, J.F.Mech, P.A.Sellers, A.M.Friedman, H.Diamond, J.R.Huizenga, Phys. Rev. 94, 974 (1954).

Bk^{249} 97 152 $\sim 1^y$

τ $\sim 1^y$ Pu(pile n) chem
α? $\sim 10^{-3}$% 5.4 ic
β^- 0.10
τ for spontaneous fission $> 10^7$y

H.Diamond, L.B.Magnusson, J.F.Mech, C.M.Stevens, A.M.Friedman, M.H.Studier, P.R.Fields, J.R.Huizenga, Phys. Rev. 94, 1083 (1954).

Bk^{250} 97 153 3.1^h

τ 3.13^h Bk^{249}(pile n) chem
β^- 0.9 p $\sim 12^y$Cf scin
1.9
γ $\sim$0.9 scin
(0.9 β) ($\sim$ 0.9γ)

A.Ghiorso, S.G.Thompson, G.R.Choppin, B.G.Harvey, Phys. Rev. 94, 1081 (1954).

Cf^{249} 98 151 $\sim 400^y$

τ $\sim 400^y$ d $\sim 1^y$ Bk chem
α 90% 5.82 ic
10% 6.0

A.Ghiorso, S.G.Thompson, G.R.Choppin, B.G.Harvey, Phys. Rev. 94, 1081; 93,908(1954).

τ $\sim 550^y$ Pu(pile n)chem ms
d $\sim 1^y$ Bk chem
α 5.81 ic
τ for spontaneous fission $> 10^6$y

H.Diamond, L.B.Magnusson, J.F.Mech, C.M.Stevens, A.M.Friedman, M.H.Studier, P.R.Fields, J.R.Huizenga, Phys. Rev. 94, 1083 (1954).

Cf^{250} 98 152 $\sim 9^y$

τ $\sim 9^y$ Pu(pile n) chem
α 6.03 ic
τ for spontaneous fission $> 10^4$y

H.Diamond, L.B.Magnusson, J.F.Mech, C.M.Stevens, A.M.Friedman, M.H.Studier, P.R.Fields, J.R.Huizenga, Phys. Rev. 94, 1083 (1954).

Cf^{250} 98 152 $\sim 9^y$

τ $\sim 12^y$ d 3.1^hBk chem
α 6.05 Pu(pile n)chem; ic
τ for spontaneous fission $\sim$5000y

A.Ghiorso, S.G.Thompson, G.R.Choppin, B.G.Harvey, Phys. Rev. 94, 1081 (1954).

Cf^{252} 98 154 2.1^y

τ $\sim 2^y$ Pu^{239}(pile n) chem
τ for spontaneous fission $\sim 100^y$

A.Ghiorso, S.G.Thompson, G.R.Choppin, B.G.Harvey, Phys. Rev. 94, 1081 (1954).

τ 2.1^y Pu(pile n) chem
α 6.12 ic
τ for spontaneous fission $\sim 60^y$

H.Diamond, L.B.Magnusson, J.F.Mech, C.M.Stevens, A.M.Friedman, M.H.Studier, P.R.Fields, J.R.Huizenga, Phys. Rev. 94, 1083 (1954).

Cf^{253} 98 155 18^d

τ 18^d Pu(pile n) chem

H.Diamond, L.B.Magnusson, J.F.Mech, C.M.Stevens, A.M.Friedman, M.H.Studier, P.R.Fields, J.R.Huizenga, Phys. Rev. 94, 1083 (1954).

τ $\sim 20^d$ Pu(pile n) chem
β^- p 19^d99 chem

G.R.Choppin, S.G.Thompson, A.Ghiorso, B.G.Harvey, Phys. Rev. 94, 1080 (1954).

99^{254}? 155 36^h

τ 36^h Pu(pile n) chem
β^- 1.1 p 3.2^h100 scin
No spontaneous fission in pure 99 samples

G.R.Choppin, S.G.Thompson, A.Ghiorso, B.G.Harvey, Phys. Rev. 94, 1080 (1954).

99^{255}? 156

τ $\sim 30^d$ Pu(pile n) chem
p $\sim 15^h$100

G.R.Choppin, S.G.Thompson, A.Ghiorso, B.G.Harvey, Phys. Rev. 94, 1080 (1954).

100^{250}? 150

τ $\sim 30^m$ U($\sim$180-Mev O^{16}) chem
α 7.7 ic

N.Atterling, W.Forsling, L.W.Holm, L.Melander, B.Åström, Phys. Rev. 95, 585 (1954).

100^{255}? 155 $\sim 15^h$

τ $\sim 15^h$ Pu(pile n) chem
α 7.1 d$\sim 30^d$99 ic

G.R.Choppin, S.G.Thompson, A.Ghiorso, B.G.Harvey, Phys. Rev. 94, 1080 (1954).

2. NEUTRON CROSS SECTIONS

Absorption cross sections for neutron energies marked "th" (thermal) have been determined, from measurements in a thermal neutron flux, in terms of the cross section value of a "standard" for neutrons of velocity 2200 m/sec. or energy ~0.025 ev. The standard used is stated just after the reference and is generally one known to have a thermal absorption cross section with a 1/v energy dependence. If the nucleus whose cross section is being measured also has a cross section with 1/v dependence, the cross section found for it by comparison with the standard will, of course, be a cross section for 2200 m/sec. If not, and the dependence often is not known, the value found by the comparison is $\overline{\sigma v}/2200$.

Target	Energy	σ	Value	Method	Ref.
H	14.1	el (θ)	graph	cc	54S48
	~90	el (θ)	graph	n scin	53S72
	~90	el (θ)	graph	n scin	54C43
	~300	el (θ)	graph	cc	54D21
	~400	el (θ)	graph	n scin	54H41
	0.0253 ev	a	0.323 *8*	mean life	54S66
	95-108	t	table		54C42
H^2	95-108	t	table		54C42
He	14.1	el (θ)	graph	cc	54S48
Li^6	1.1	n,H^3(θ)	table	ppl	54W24
	1.5	n,H^3(θ)	table	ppl	54W24
	2.0	n,H^3(θ)	table	ppl	54W24
B	0.0253 ev	a	744 *20*	mean life	54S66
B^{10}	14.1	n, d_o*	0.021	pc	54R15
	14.1	n, d_1*	0.016	pc	54R15
	*d_o to g.s. Be^9; d_1 to 2.43-Mev level Be^9				
C	62-108	t	table		54C42
C^{12}	14.1	n,n'+4.4 γ	0.3	γ scin	54T14
C^{13}	th	n,γ	0.9 *2mb*	~5600 ^yC	54H44
N	14.1	el	0.82	cc	54S48
	14.1	el (θ)	graph	cc	54S48
	14.1	inel	0.48	cc	54S48
	14.1	inel (θ)	graph	cc	54S48
	14.1	2 prong	0.27	cc	54S48
	14.1	3 prong	0.016	cc	54S48
	3-13	t	graph		54N17
O	95-108	t	table		54C42
O^{16}	14.1	n,n'+6.1 γ	0.2	γ scin	54T14
	14.1	n,n'+~7 γ	0.05	γ scin	54T14
F^{19}	3-13	t	graph		54N17
Mg	3-13	t	graph		54N17

Target	Energy	σ	Value	Method	Ref.
Al^{27}	0.8-2.7	n,n'+0.85 γ	graph	γ scin	54K24
	1.0-2.7	n,n'+1.03 γ	graph	γ scin	54K24
	2.2-2.7	n,n'+2.23 γ	graph	γ scin	54K24
	95-108	t	table		54C42
Si	95-108	t	table		54C42
P^{31}	3-13	t	graph		54N17
S	2.2-4	(n,a)/(n,p)	graph		54H37
Cl	3-13	t	graph		54N17
Cl^{35}	th	n,p	0.30	ppl	54B65
Cl^{37}	pile	n,γ	~0.005	1.0 ^SCl	54S37
Ti	3-13	t	graph		54N17
Cr	1.4-2.7	n,n'+1.44 γ	graph	γ scin	54K24
Cr^{54}	pile	n,γ	0.36	3.6 ^mCr	54B57
Mn^{55}	0.1-12 kev	t	graph		54S61
	3-13	t	graph		54N17
Fe	4.3	el	~2.6	ppl	54J6
	0.8-2.7	n,n'+0.85 γ	graph	γ scin	54K24
	4.3	n, 3.45 n'	~0.9	ppl	54J6
	4.3	n, 2.2 n'	~0.4	ppl	54J6
	4.3	n, 1.6 n'	~0.2	ppl	54J6
	95-108	t	table		54C42
Co^{59}	3-13	t	graph		54N17
Ni	1.3-2.7	n,n'+1.33 γ	graph	γ scin	54K24
	1.3-2.7	n,n'+1.47 γ	graph	γ scin	54K24
	3-13	t	graph		54N17
Zn	3-13	t	graph		54N17
Se	3-13	t	graph		54N17
Br	3-13	t	graph		54N17
Br^{79}	pile		~0.01	5.1 ^SBr?	54S37

Neutron Cross Sections continued

Target	Energy	σ	Value	Method	Ref.
Mo	3-13	t	graph		54N17
Ag	0.0253 ev	a	58 *2*	mean life	54S66
	2.5-800 ev	t	graph		54S61
	3-13	t	graph		54N17
Cd	3.7	el	2.5	n scin	54S31
	3.7	el (θ)	graph	n scin	54S31
	3.7	t	4.5		54S31
	3-13	t	graph		54N17
Sn	3.7	el	2.5	n scin	54S31
	3.7	el (θ)	graph	n scin	54S31
	3.7	t	4.6		54S31
	3-13	t	graph		54N17
Sb	3-13	t	graph		54N17
Te	3-13	t	graph		54N17
I^{127}	10-800 ev	t	graph		54S61
La	3-13	t	graph		54N17
Eu	0.08-58 ev	t	graph		54S11
Ta^{181}	3-13	t	graph		54N17
W	3-13	t	graph		54N17
Au^{197}	3-13	t	graph		54N17
Hg	3-13	t	graph		54N17
Tl	3-13	t	graph		54N17
Pb	1.2-2.7	n,n'+0.81 γ	graph	γ scin	54S24
	62-108	t	table		54C42
Bi^{209}	3.7	el	6.9	n scin	54S31
	3.7	el (θ)	graph	γ scin	54S31
	0.8-2.7	n,n'+0.90 γ	graph	γ scin	54K24
	0.8-2.7	n,n'+1.56 γ	graph	γ scin	54K24
	3.7	t	8.3		54S31
U^{235}	0.0253 ev	a	691	chopper	54P13
Pu^{239}	th	σ_f/σ_f(U)	206 *4*		54L20
Am^{243}	pile	n,γ	~115	ms	54S33
	pile	n,γ	~140	26^mAm	54H40
Cm^{244}	pile	n,γ	~25	ms	54S33
Cm^{245}	pile	n,γ	~200	ms	54S33
Cm^{246}	pile	n,γ	~15	ms	54S33
Bk^{249}	pile	n,γ	~1100	3.1^hBk	54H40

Neutron Cross Sections continued

Target	Energy	σ	Value	Method	Ref.
Cf^{249}	pile	n,γ	270	~9^yCf	54H40
	pile	a	~900	Cf^{249} loss	54H40
Cf^{252}	pile	n,γ	30	19^d99	54H40
Cf^{254}	pile	n,$\gamma\beta$	<2	~15^h100	54H40
99^{253}	pile	n,γ	160	3.2^h100	54H40
99^{254}	pile	n,γ	<15	~15^h100	54H40

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3. GROUND STATE Q'S

For these data it seemed impractical to follow the policy adhered to in the main list of giving the A value of a target nucleus only when enriched material was used or when the target element is known to be monoisotopic. In the following reactions, the A values assigned by the experimenters to target and product nuclei are given as superscripts. In cases where enriched material was used, the superscript is underlined.

The standard used for the measurement of the energy of the incident or emitted light particle (whichever presented the greatest difficulty) is listed with the reference. In cases where the same standard was used for both measurements, special mention of this fact is made following the value assigned to the standard.

Reaction	Value		Source	Detector	Ref.
$H^{2}(\gamma,n)H^{1}$	-2.227	3	EA	BF_3	54N16
$Li^{7}(p,n)Be^{7}$	-1.6462[a]	10	VdG	BF_3	54J10
$Li^{7}(p,n)Be^{7}$	-1.6447[b]	10	VdG	BF_3	54J10
$Be^{9}(\gamma,n)Be^{8}$	-1.662	3	EA	BF_3	54N16
$B^{\underline{10}}(p,n)C^{10}$	-4.35	20	Cyc	ppl	54A16
$B^{11}(d,p)B^{12}$	+1.100			s	54K23
$O^{\underline{18}}(p,\alpha)N^{15}$	+3.961	9	CcW	s	54M60
$Ne^{\underline{20}}(d,\alpha)F^{18}$	+2.791	9	CcW	s	54M61
$Ne^{\underline{20}}(d,p)Ne^{21}$	+4.526	9	CcW	s	54A21
$Ne^{\underline{22}}(d,p)Ne^{23}$	+2.968	8	CcW	s	54A20
$Mg^{\underline{25}}(p,\gamma)Al^{26}$	+6.35			scin	54K20
$Al^{\underline{27}}(d,p)Al^{28}$	+5.475			s	54K23
Did not resolve doublet					
$Si^{28}(d,\alpha)Al^{26}$	+1.416	8	VdG	s	54B60
$Si^{28}(p,n)P^{28}$	-14.9	6	Cyc	0.28[s]P	54B55
$Si^{\underline{29}}(p,\gamma)P^{30}$	+5.55			scin	54E13
$S^{32}(p.n)Cl^{32}$	-14.1	6	Cyc	0.31[s]Cl	54B55
$Ca^{\underline{42}}(d,p)Ca^{43}$	+5.70		VdG	s	54B45
$Ca^{\underline{44}}(d,p)Ca^{45}$	+5.19		VdG	s	54B45

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